

**End Semester Examination, May 2017**  
**B. Tech.–Second Semester**  
**BASICS OF AERONAUTICAL ENGINEERING (AE-201)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer the following question:

- a) What is a monocoque structure? Explain its salient features.
- b) Discuss the importance of strength/weight ratio in aerospace industry.
- c) What is instrument Landing System (ILS)? Name its major components.
- d) What are components of a basic hydraulic system?
- e) What is pump feed systems?
- f) Define aerodynamic centre.
- g) Explain the concept of infinite wing.
- h) What is a hovercraft? How does it function?
- i) Explain airfoil NACA 22430.
- j) Explain the concept of rocket staging.

2 × 10

**PART-A**

- Q.2 a) Define a flight vehicle. Write the difference between an aerostatic craft and an aerodynamic craft with examples. Explain how they take-off and fly. 10
- b) List the differentiating features of a transport aircraft, a fighter aircraft, a helicopter and a spacecraft. 10
- Q.3 a) Explain different types of drag associated with aircraft. Draw and explain the drag polar? 5
- b) Draw forces acting on an aircraft in level flight and accelerated flight. Also write the equations that govern these motions. 5
- c) What are high lift devices? Draw  $C_L$  vs  $\alpha$  curve for wing having aileron and leading edge slat. Explain diagrammatically how the curve shifts as a result of these devices. 10
- Q.4 a) What are contra-rotating propellers? Write their advantages and disadvantages. 6
- b) Explain how a jet engine helps in moving the aircraft forward. What are the effects caused by wings and fuselage during flight? 8
- c) Explain Otto cycle with the help of a suitable p-v diagram. 6

**PART-B**

- Q.5 a) With the help of suitable diagram, explain bending, shear and torsional effect of forces. 5
- b) What is Hooke's law? Draw stress vs strain curve for steel highlighting critical points. 5
- c) Write different types of tail-planes and undercarriages. 5
- d) Draw and explain V-n diagram. 5
- Q.6 a) What are different flight instruments and engine instruments? What is true air speed? Write down mathematical relation used to find equivalent air speed. 10
- b) Explain the function of very high frequency omnidirectional range navigation system (VOR). 10
- Q.7 a) What are the advantages of hydraulic systems as power sources for operating various aircraft units? 10
- b) What are control surfaces? Explain the function of different control surfaces. 10

**End Semester Examination, May 2017**  
**B. Tech. –Third Semester**  
**ELEMENTS OF AERONAUTICAL ENGINEERING (AE-301)**

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer (*any five*) of the following:

- a) How do we achieve short take-off and landing of an aircraft? How do the gliders and the powered gliders take off?
- b) Plot typical pressure distribution on an airfoil in a subsonic flow at low angle of attack. Show the changes that take place when the angle of attack is increased.
- c) What do you understand by Frise ailerons, horn balance and mass balance that are used on control surfaces?
- d) What do you understand by 'compressor air bleed' and for what services is this bleed air used?
- e) What is the simplest jet engine that has been used to power a flight vehicle? What is the basis of its simplicity?
- f) What do you understand about loop antenna and sense antenna?
- g) What do you understand by a hybrid propellant rocket engine?
- h) Define load factor. What are the implications of load factor? 4x5

**PART-A**

- Q.2 a) What is the difference between an aircraft and a rocket? Explain their features with examples of each type. 5
- b) Explain with the help of suitable sketches, the operation of a double cantilever, spring leaf type main landing gear. 5
- c) What do you understand by tilt-rotor concept? Draw a sketch to explain the operation of aircraft using this concept. What are the advantages of a tilt-rotor over other V/STOL aircraft? 10
- Q.3 a) What are main sources of drag? What is induced drag? How do finite wings generate induced drag? 12
- b) What is difference between static stability and dynamic stability? 4
- c) What are conditions of static lateral and directional stability? Draw typical pitching moment vs  $\alpha$  plots in case of a statically stable and unstable airplane. 4
- Q.4 a) Describe the function of a propeller. What is pitch of a propeller? What are fixed pitch and variable pitch propellers? 10
- b) Describe the features and functions of ramjet engine, pulse jet engine and rocket engines of solid propellant and liquid propellant type. 10

**PART-B**

- Q.5 a) What is the importance of strength / weight ratio in the design of aircraft and its components? 5
- b) Explain the type of loads that are resisted by the following structural components of an aircraft during flying: i) fuselage ii) wings, and iii) tailplane 15
- Q.6 a) The operation of GPS involves three segments. Discuss each of these segments giving details of information supplied/ monitored by each of them. 10

- b) What information is provided by the VOR and DME to the pilot? Explain the operation of DME. 10

- Q.7 a) Why do we need an auto-pilot system? Explain the essential features and operation of an auto-pilot system used in an aircraft. 15
- b) What is the difference between a single action and a double action hand pump? 5

**End Semester Examination, May 2017**  
**B. Tech.–Fourth Semester**  
**AERODYNAMICS-I (AE-401)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer *any five* of the following:

- a) What are the two basic sources of aerodynamic forces and moments on a body? Explain with suitable illustrations.
- b) How do we differentiate the geometric twist from aerodynamic twist of a finite wing? Define both the forms of twist.
- c) Summarize the statement of Kutta condition for a given airfoil at a given angle of attack.
- d) Skin friction drag coefficient is a function of Reynolds number for a flow over a flat plate. What are the values of this coefficient when the flow is: i) laminar, and ii) turbulent over a flat plate?
- e) Explain through suitable plots the influence of taper ratio on induced drag factor  $\delta$  for different aspect ratios.
- f) Define displacement thickness. What are its physical interpretations? 2 × 10

**PART-A**

- Q.2 a) Define Buckingham pi theorem. When can two different flow fields over two different bodies be taken as dynamically similar? 10  
 b) For a cambered airfoil, the generalized solution of the vortex strength includes Fourier sine series terms. Determine the values of coefficients  $A_0$  and  $A_n$ . Explain the physical significance of these coefficients. 10
- Q.3 a) For a finite wing, how does a general lift distribution differ from an elliptical lift distribution? Compare the induced drag coefficients in both the cases. What are the shapes of span wise lift distributions when the influence of fuselage and action of aileron operation during rolling are taken into account? 10  
 b) What is span efficiency factor? How does it affect the induced drag coefficient? 10
- Q.4 A rectangular wing with an aspect ratio of 5.5 and the induced drag factor  $\delta = 0.065$  has the induced drag coefficient of 0.015. Calculate the lift coefficient of this wing. Also calculate the induced drag coefficient for another wing which has the same lift coefficient as the first wing but has an aspect ratio of 11. Assume that the induced factors for drag and lift coefficient,  $\delta$  and  $\tau$  respectively, for the second wing are equal and same as for the first wing. At an angle of attack of  $5^\circ$  and zero lift angle of attack of  $-2^\circ$ , what are the lift slope of the first wing and that of the airfoil used in that? 20

**PART-B**

- Q.5 a) Using a vortex panel numerical method for flows over arbitrary airfoils, determine the normal component of the flow velocity at the  $i^{\text{th}}$  control panel due to all the  $n$  vortex panels considered. Using the above approach, how many of such algebraic equations can be written? 10

- b) Given a solution of the strength of all the vortex panels considered in the vortexpanel numerical method for flows over arbitrary airfoils, how do we obtain lift perunit span for the airfoil? What is a second order vortex panel? 10

- Q.6 a) For an incompressible flow over a flat plate, derive Blasius equation. What is theadvantage of this equation over the original boundary layer equation for flow overa flat plate? 16

- b) Discuss the incompressible velocity profile for flat plate as an outcome of the solutionof the Blasius boundary layer equation. 4

- Q.7 a) Explain the phenomenon of boundary layer separation indicating the flow conditionsthat are conducive to flow separation. 10

- b) Explain the processes of suction and blowing of boundary layers, which are used tocontrol the growth of boundary layer. 10

**End Semester Examination, May 2017**  
**B. Tech.–Fourth Semester**  
**AIRCRAFT STRUCTURES-I (AE-402A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

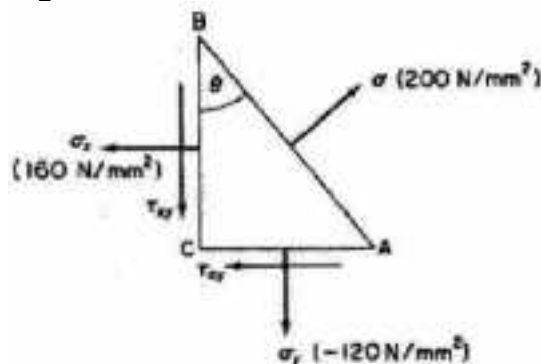
Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1
- Explain principle of superposition.
  - Define redundancy.
  - Explain the role of longerons and stressed skin structure in fuselage design.
  - Explain the concept of unit load method for truss analysis.
  - Explain the importance of gust analysis for an aircraft.
  - Define strain energy.
  - What do you mean by limit load and Ultimate load of any structure?
  - What do you mean by shear flow?
  - Explain briefly, the stress-strain relationship.
  - State the importance of V-n diagram.

2 × 10

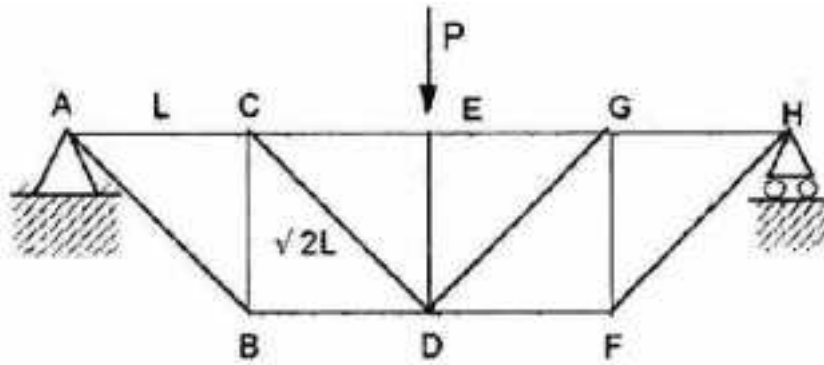
**PART-A**

- Q.2 Explain the flight envelope and V-n diagram. Explain the Importance of factor of safety and gust load. 20
- Q.3 Direct stresses of  $160 \text{ N/mm}^2$  (tension) and  $120 \text{ N/mm}^2$  (compression) are applied at a particular point in an elastic material on two mutually perpendicular planes. The principal stress in the material is limited to  $200 \text{ N/mm}^2$  (tension). Calculate the allowable value of shear stress at the point on the given planes. Determine also the value of the other principal stress and the maximum value of shear stress at the point. Verify your answer using Mohr's circle.



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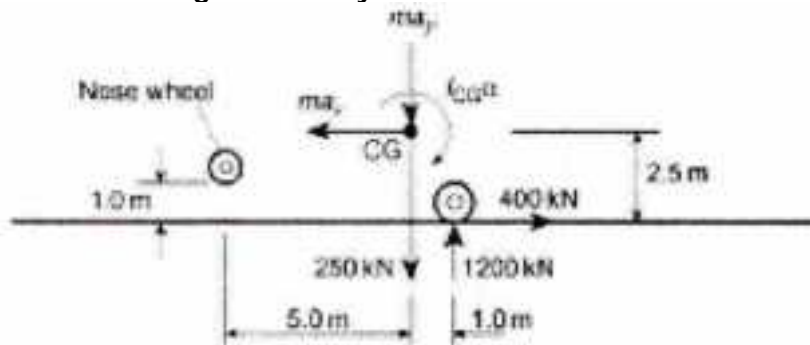
- Q.4 For the truss shown below, calculate the forces in all bars using method of joints.



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### PART-B

- Q.5 An aircraft, having a total weight of 250 kN and a tricycle undercarriage, lands at a vertical velocity of 3.7 m/s, such that the vertical and horizontal reactions on the main wheels are 1200 kN and 400 kN respectively; at this instant the nose wheel is 1.0 m from the ground, as shown in the figure. If the moment of inertia of the aircraft about its CG is  $5.65 \times 10^8 \text{ N s}^2 \text{ mm}$ , determine the inertia forces on the aircraft, the time taken for its vertical velocity to become zero and its angular velocity at this instant.

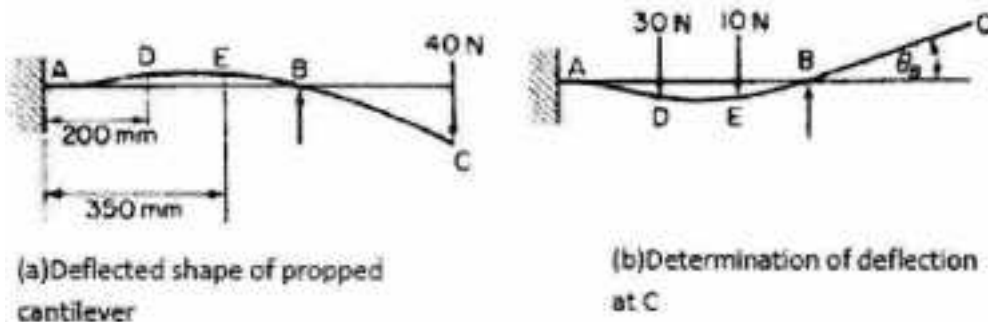


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- Q.6 State the Maxwell's reciprocal theorem. A cantilever 800 mm long with a prop 500 mm from the wall deflects in accordance with the following observations when a point load of 40 N applied to its end:

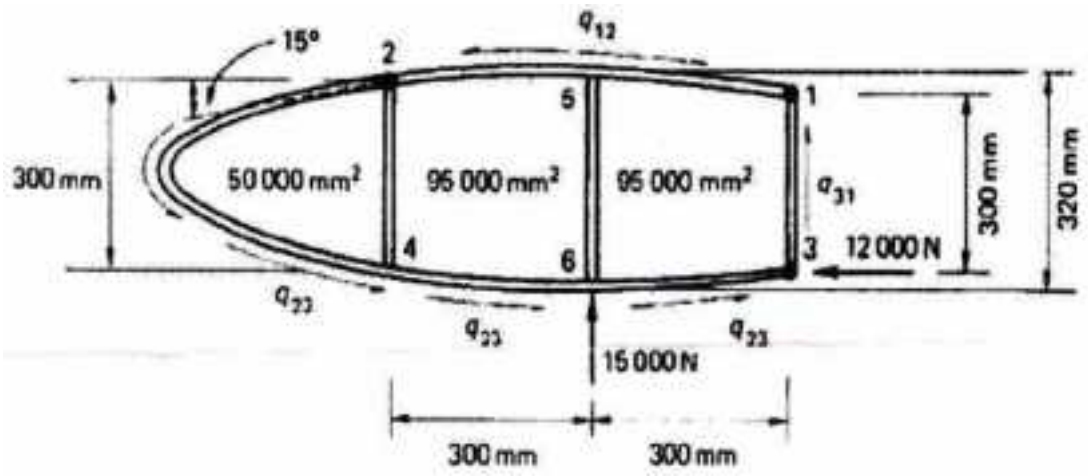
Distance (mm)	0	100	200	300	400	500	600	700	800
Deflection (mm)	0	-0.4	-1.5	-2.4	-1.8	0	2.4	4.8	10.5

What is the angular rotation of the beam at the prop due to a 30 N load applied 200 mm from the wall, together with a 10 N load applied 350 mm from the wall? The initial deflected shape of the cantilever is shown below:



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- Q.7 Calculate shear flows in the web panels and the axial loads in the flanges of the wing rib shown in the figure below. Assume that the web of the rib is effective only in shear while the resistance of the wing to bending moment is provided entirely by the three flanges 1, 2 and 3:



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**End Semester Examination, May 2017**  
**B. Tech.–FourthSemester**  
**AIRCRAFT PROPULSION-I (AE-403)**

Time: 3 hrs.

Max Marks:100

No. of pages:2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

- Q.1
- What is over-all heat transfer co-efficient?
  - Explain Flow co-efficient.
  - What is manifold?
  - What is Fourier's law?
  - What is Blade element theory of propellers?
  - What is induced velocity?
  - Draw the schematic diagram of the Brayton cycle.
  - What is knock rating?
  - Define specific impulse of a rocket motor.
  - Explain turbojet engine.
- 2×10

**PART-A**

- Q.2
- Sketch and explain valve timing diagram of CI engine. 5
  - Explain with suitable sketches the working of a four stroke Diesel engine. 7
  - A 3L-V6 engine is connected to a dynamometer which gives a brake output torque reading of 205 Nm at 3600 rpm. At this speed air enters the cylinder at 85kPa and 60°C and mechanical efficiency is 60%. Calculate:
    - Brake power
    - Indicated power
    - BMEP
    - IMEP2×4
- Q.3
- Define and explain convection and radiation? 5
  - A long hollow cylinder has inner and outer diameter of 2 cm and 4 cm respectively. Thermal conductivity of cylinder is 0.58W/mK. The inner and outer part is maintained at 70°C and 100°C. Find the heat flow rate per unit length of the cylinder 5
  - An un-insulated steam pipe passes through a room in which air and walls are at 25 degree Celsius. The outside diameter of the pipe is 70 mm and its surface temperature and emissivity are 200 degree Celsius and 0.8 respectively. What is the surface emissive power? If the co-efficient associated with free convection heat transfer from the surface to the air is 15W/m<sup>2</sup>K. What is the rate of heat loss from the surface per unit length of the pipe? 10
- Q.4
- Differentiate between axial and centrifugal compressor. 5
  - A gas turbine unit operates at a mass flow rate of 30 kg/s. Air enters the compressor at a pressure of 1 bar and temperature 15°C and is discharged from the compressor at a pressure of 10.5 bars. Combustion occurs at constant pressure and results in a temperature rise of 420K. If the flow at the exit of the turbine at a pressure of 1.2 bar. Determine net power output from the unit. 8
  - What is meant by a stage and explain in detail the stage velocity triangles? 7

**PART-B**

- Q.5 a) Explain the ideal actuator theory of propellers. Derive the expressions for the thrust generated and power absorbed by the propeller. 7
- b) A helicopter has single rotor of 15 m diameter and its weight is 24 kN. Calculate the power required for hovering of helicopter by using momentum theory at a height where air density is  $1.226 \text{ kg/m}^3$ . 8
- c) Draw a neat diagram of sectional geometry and local flow details of a propeller. 5
- Q.6 Write short notes on:
- Blending.
  - Carburetion.
  - Fuel injector.
  - Hydrocarbons.
  - Gas turbine fuels. 4 × 5
- Q.7 a) With a neat sketch and T-S diagram, explain the working of turbojet engine and mention its various advantages. 5
- b) For one dimensional flow develop a relationship among velocity, area and Mach number at a station in a converging diverging duct, assuming the gas flow to be isentropic. 5
- c) A turbojet power plant uses aviation kerosene having a calorific value of 3 MJ/Kg. The fuel consumption is 0.18 kg per hour per N of thrust, when the thrust is 9 kN. The aircraft velocity is 500 m/s the mass of air passing through the compressor is 27 kg/s, calculate the air-fuel ratio and overall efficiency. 10

**End Semester Examination, May 2017**  
**B. Tech.–Third/Fourth Semester**  
**AIRCRAFT MATERIALS (AE-404)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) Define 'annealing' and 'quenching'.
  - b) Explain Rockwell hardness.
  - c) What is plain carbon steel?
  - d) Write properties of phosphorus.
  - e) What will be SAE numbering system for manganese steel?
  - f) What will be percentage of carbon in hypo-eutectoid?
  - g) What is chrome-nickel steels?
  - h) Write composition of K Monel.
  - i) Write properties of strain-hardened alloys (wrought alloys).
  - j) What are the types of reinforcements in composites?
- 2 × 10

**PART-A**

- Q.2
- a) What are economic factors that affect choice of materials for different parts of airplane? 10
  - b) Explain temperature variation over body of Concorde aircraft with proper sketch. 10
- Q.3
- a) What are different allotropic forms of pure iron? Draw and explain temperature vs percentage of carbon curve showing different critical points. 10
  - b) Write normalizing and heat treatment steps for mild carbon steel. 10
- Q.4
- a) What is fatigue? Explain different types of fatigue loading with examples. 7
  - b) How does corrosion of dissimilar metals occur? Arrange the following metals in decreasing order of anodic behavior: Mg, Al, Zn, Cd, Cr. 7
  - c) Classify corrosion resisting steel and write property of each category. 6

**PART-B**

- Q.5
- a) Write a note on magnesium alloy in reference to aircraft construction. Write specific gravity of Mg alloy, aluminium, steel. 6
  - b) What is Alclad alloy? Explain its properties as an aircraft material. 7
  - c) What is brass? Explain how alpha solution and beta solution conditions exist? 7
- Q.6
- a) How are nickel alloys important for aircraft structures? What is composition of Inconel and state its uses? 7
  - b) What is naval brass? What are its applications? 6
  - c) Explain season cracking. 7
- Q.7
- a) What are the functions of a reinforcing agent? 7
  - b) What are advanced fibres and natural fibres? Also give examples. 6
  - c) What are alumina fibres? Write its properties and application. 7

# End Semester Examination, May 2017

## B. Tech.–Fifth Semester AERODYNAMICS-II (AE-501)

Time: 3 hrs

Max Marks: 100

No. of pages: 3

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

i) For air as working medium, use  $\gamma = 1.4$ ,  $c_p = 1005 \text{ J/kg K}$  and  $R = 287 \text{ J/kg K}$ .

ii) The Gas tables are allowed, you may demand, if required.

Q.1 Fill in the blanks:

- Ratio of inertial force and elastic force is \_\_\_\_\_.
- Ratio of inertial force and \_\_\_\_\_ force is Reynolds number.
- \_\_\_\_\_ and \_\_\_\_\_ flow conditions are assumed to model the flow using complex potential function.
- If air has static temperature of 300 K, the speed of sound works out to \_\_\_\_\_.
- For a process to be isentropic, it has to be \_\_\_\_\_ and \_\_\_\_\_.
- Pitot-tube measures \_\_\_\_\_ pressure.
- Total pressure across a shock wave \_\_\_\_\_ whereas total temperature \_\_\_\_\_.
- When flow is turned \_\_\_\_\_ itself, expansion fans are formed?
- Two \_\_\_\_\_ are observed on delta wing aircraft.
- Shock expansion theory is used only when waves are \_\_\_\_\_ to the surface.
- For an inviscid flow \_\_\_\_\_ is not considered.
- For Mach number 2 \_\_\_\_\_ is the minimum wave angle.
- Delta wing configuration is mostly used in \_\_\_\_\_ aircraft.
- \_\_\_\_\_ and \_\_\_\_\_ are maintained in conformal mapping.
- The phenomena of shock and expansion waves are \_\_\_\_\_ in incompressible flow.
- For  $M=3$ , Prandtl Meyer function,  $v(M)$  is \_\_\_\_\_.

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### PART-A

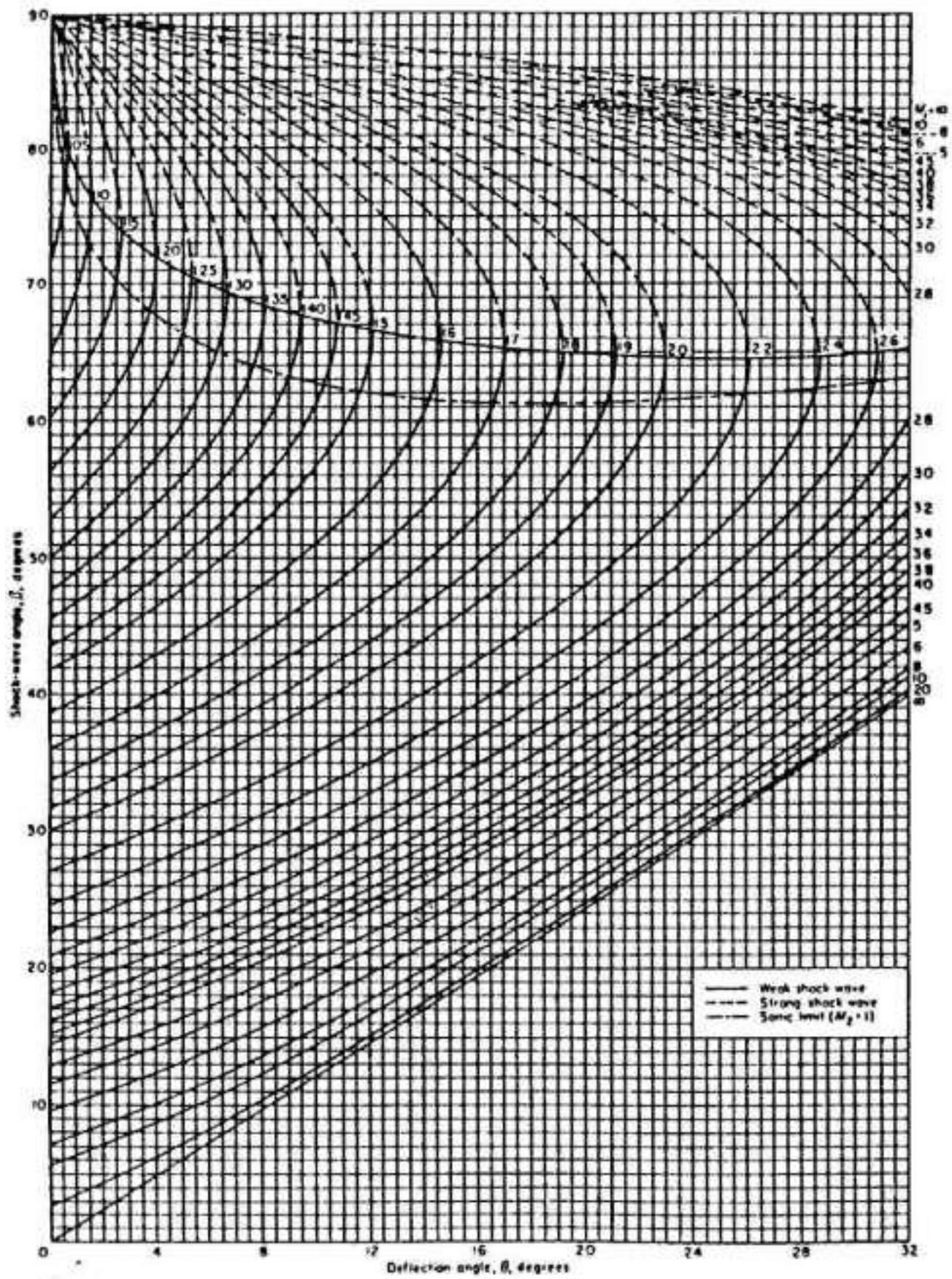
- Q.2 a) What are complex potential and conformal transformations? 5  
b) Transform a circle into a symmetrical airfoil profile using the Kutta-Zhukovsky transformation and obtain lift for the same. 15

- Q.3 Explain why delta wing configuration is adopted in high speed military aircrafts. Also discuss the subsonic flow characteristics over a delta wing and state the assumptions and theory given by Polhamous to calculate lift over delta wing. 20

- Q.4 a) Derive the Prandtl relation for 1-dimensional, steady flow across a normal shock wave and state the important conclusion obtained from it. 10  
b) Air flows adiabatically through a duct. At point 1, the velocity is 240 m/s, with  $T_1 = 320 \text{ K}$  and  $P_1 = 170 \text{ kPa}$ . Calculate (a)  $T_{01}$  (b)  $P_{01}$  (c)  $M_1$  (d)  $\rho_{01}$ . At point 2 further downstream  $V_2 = 290 \text{ m/s}$  and  $P_2 = 135 \text{ kPa}$ , calculate (e)  $T_{02}$  and (f)  $P_{02}$ . 10

### PART-B

- Q.5 A symmetrical diamond shaped airfoil having semi vertex angle  $2^\circ$  is kept at  $2^\circ$  angle of attack to free-stream flow having Mach number 2.2 and pressure 1 atm. With help of a diagram, explain compressible flow phenomenon (shock or expansion) happening over the airfoil. Use shock expansion theory to calculate coefficients of lift and drag. 20
- Q.6 With the help of diagrams explain the wave patterns setup by a particle moving at a) subsonic b) sonic and c) supersonic speed. In the process explain what is Mach wave and Mach angle ( $\mu$ ). 20
- Q.7 List the various methods to model compressible flow using velocity potential equation. Explain the procedure to model this type of flow using method of characteristics. Also give your opinion on different methods. 20



## End Semester Examination, May 2017

### B. Tech.(Aeronautical) —Fifth Semester AIRCRAFT PROPULSION-II (AE-502)

Time: 3 hrs.

Max Marks: **100**

No. of pages: **2**

Note: Attempt **FIVE** questions in all; **Q.1** is compulsory. Attempt **ANYTWO** questions from **PART-A** and **TWO** questions from **PART-B**. Each question carries equal marks.

Q.1 Answer the following briefly:

- a) In case of isentropic flow through duct of varying area, write an expression for area ratio  $A/A^*$  in terms of inflow Mach number.
- b) Explain the pressure loss occurring in the combustion process with the help of a T-S diagram.
- c) For a turbofan engine, define fan pressure ratio and by-pass ratio.
- d) What methods are normally used for thrust augmentation? Show the cycle of turbojet engine with afterburning on a T-S diagram.
- e) Define and explain the effect of slip factor ( $\sigma$ ) and power input factor ( $\psi$ ).
- f) Why pre-whirl is provided to the flow entering the centrifugal compressor? How does it affect the work input capacity of the compressor?
- g) Explain how through a stage of an axial compressor, increase in  $C_a$  results in a decrease in work absorbing capacity  $W$ .
- h) Plot the variation of velocity in the wake of a compressor blade cascade.
- i) What devices are used for starting of a turbo-jet engine?
- j) Draw a schematic sketch of turbine blades showing the fir tree arrangement of fixing the blades in the turbine disc.

**2×10**

### PART-A

- Q.2
  - a) In case of isentropic flow through duct of varying area, derive an expression for non-dimensional mass flow rate in terms of Mach number. **10**
  - b) Explain the conditions of a choked flow through a convergent divergent nozzle. What are the critical conditions in such a flow? **10**
- Q.3
  - a) Explain the processes of a simple turbojet engine ideal cycle. Write the thrust equation and explain its components, namely, gross momentum thrust, intake momentum drag and pressure thrust. Define propulsion thrust. Explain the conditions under which we get maximum thrust or maximum propulsion efficiency. **10**
  - b) Explain the difference between isentropic efficiency of air intake and ram efficiency. What is the pressure recovery factor? **10**

Q.4 For a single sided centrifugal compressor with the following data, consider the design of the diffuser.

Power input factor  $\psi = 1.04$ ,  
 Rotational speed  $N = 295$  rps,  
 Eye tip diameter = 0.35 m,  
 Inlet stagnation temp.  $T_{01} = 290$  K,  
 Inlet stagnation pressure  $p_{01} = 1$  bar  
 Radial width of vane less space: 5 cm  
 Depth of diffuser passage: 2 cm

Slip factor  $\sigma = 0.9$ ,  
 Overall diameter of impeller = 0.6 m,  
 Eye root diameter = 0.20 m  
 Air mass flow  $\dot{m} : 9$  kg/s,  
 Isentropic efficiency  $\eta_c = 0.78$   
 Mean radius of the diffuser throat: 0.38 m  
 Number of diffuser vanes: 12

Determine (a) the inlet angle of the diffuser vanes, and (b) the throat width of the diffuser. 20

**PART-B**

- Q.5 a) In an axial compressor stage, describe the type of blading that is formed if the degree of reaction  $\Lambda$  is equal to 0, 0.5 and 1. 10  
 b) Draw the velocity diagrams of a compressor stage at blade root radius, mean radius and blade tip radius for a typical rotational speed. Take same value of axial velocity across the stage  $C_a = C_1$  in all these cases. 10

- Q.6 a) Draw schematic sketches of three types of combustion chambers used in jet engines. Explain the combustion process that takes place in a typical combustion chamber. 10  
 b) Define the pressure loss factor in respect of a combustion chamber. How does it vary with change in temperature ratio? Define fundamental loss and cold loss. Explain the difference between the two. 10

- Q.7 a) Explain how the following expressions can be derived for a simple single stage turbine:

$$\tan \beta_3 = \frac{1}{2\phi} \left( \frac{1}{2}\psi + 2\Lambda \right)$$

$$\tan \beta_2 = \frac{1}{2\phi} \left( \frac{1}{2}\psi - 2\Lambda \right)$$

Where  $\beta_2$  and  $\beta_3$  are the inlet and exit flow angles relative to the rotor blade and  $\psi$ ,  $\phi$ , and  $\Lambda$  are blade loading coefficient, flow coefficient and degree of reaction respectively. 10

- b) What do you understand by vortex blading for turbine? What conditions need to be satisfied for free vortex design of turbine blades? 10



**End Semester Examination, May 2017**  
**B. Tech. – Fifth / Sixth Semester**  
**AIRCRAFT STRUCTURES-II (AE-503A)**

Time: 3 hrs

Max Marks: 100

No. of pages: 4

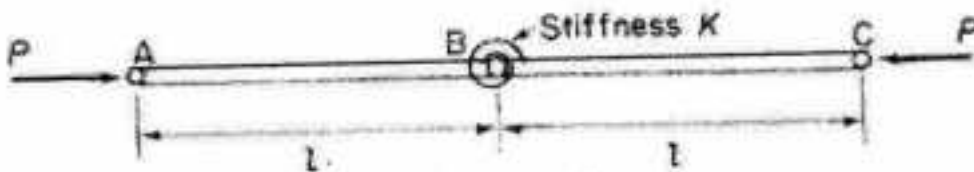
Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Briefly answer:

- a) What types of columns are designed to prevent material elastic failure?
  - b) Define 'slenderness ratio'.
  - c) State the principle of stationary value of the total complementary energy.
  - d) Differentiate between 'tangent modulus equation' and 'reduced modulus equation'.
  - e) Define 'buckling'.
  - f) Differentiate between 'local and global co-ordinate system'.
  - g) Derive the stiffness matrix for a single elastic spring.
  - h) What are the implications of structural idealization?
  - i) Define 'margin of safety'.
  - j) Why bolt holes are always slightly larger than the bolt diameter?
- 2 × 10

**PART-A**

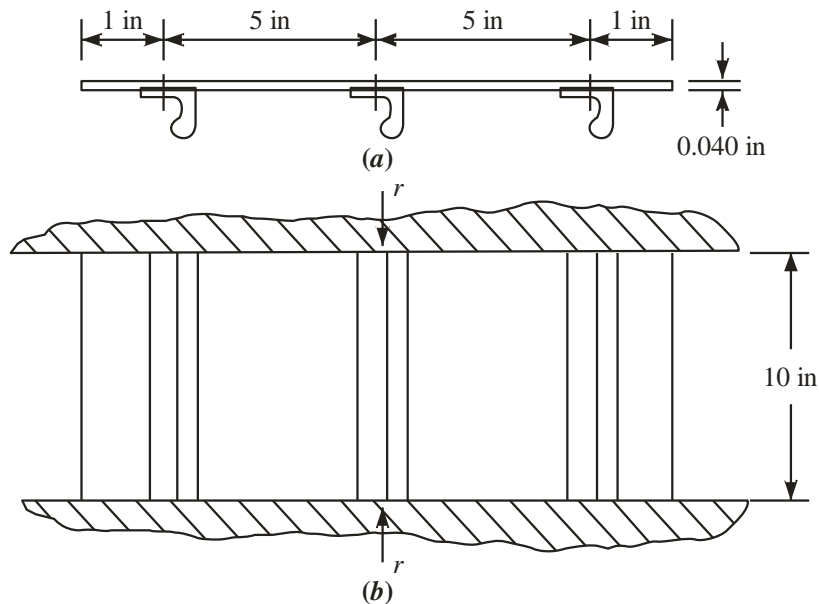
- Q.2 The system shown in figure below consists of two bars AB and BC, each of bending stiffness  $EI$  elastically hinged together at B by a spring of stiffness  $K$  (i.e. bending moment applied by spring =  $K \times$  change in slope across B). Regarding A and C as simple pin-joints, obtain an equation for the first buckling load of the system. What are the lowest buckling loads when a)  $K \rightarrow \infty$ , b)  $EI \rightarrow \infty$ . Note that B is free to move vertically.



Data given:  $EI \frac{d^2v}{dx^2} = -Pv$  and general solution  $v = A \cos \mu x + B \sin \mu x$

20

- Q.3 The sheet stringer panel shown in figure below is loaded in compression by means of rigid members. The sheet is assumed to be simply supported at the loaded ends and at the rivet lines and to be free at the sides. Each stringer has an area of  $0.1 \text{ m}^2$ . Assume  $E = 10,300,000 \text{ lb/in}^2$  for the sheet and stringers. Find the total compressive load  $P$ :
- a) When sheet buckles first. 7
  - b) When the stringer stress  $\sigma_c$  is  $15,000 \text{ lb/in}^2$  7
  - c) When the stringer stress  $\sigma_c$  is  $35,000 \text{ lb/in}^2$  6
- $K = 3.62$  (given)



- Q.4 An initially untwisted rectangular wing of semi-span ' $s$ ' and chord ' $c$ ' has its flexural axis normal to the plane symmetry, and is of constant cross-section with torsional rigidity  $GJ$ . The aerodynamic centre  $ec$  ahead of the flexural axis, the lift-coefficient slope is ' $a$ ' and the pitching moment coefficient at zero lift is  $C_{m,0}$ . At speed  $V$  in the air density  $\rho$ , the wing root incidence from the zero lift line is  $\alpha_0$ . Using simple strip theory i.e. ignoring downwash effects, show that the incidence at a section distant  $y$  from the plane of symmetry is given by –

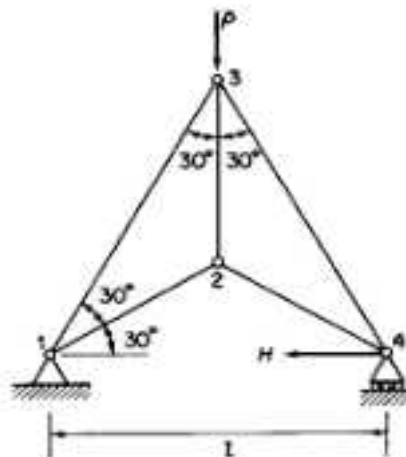
$$\alpha_0 + \theta \left( \frac{C_{m,0}}{ea} + \alpha_0 \right) \frac{\cos \lambda (s - y)}{\cos \lambda s} - \frac{C_{m,0}}{ea}$$

$$\text{where } \lambda^2 = \frac{ea \frac{1}{2} \rho V^2 c^2}{GJ}$$

Hence, assuming  $C_{m,0}$  to be negative, find the condition giving the speed at which the lift would be reduced to zero 20

### PART-B

- Q.5 Use the stiffness method to find the ratio  $H/P$  for which the displacement of node 4 of the plane pin-jointed frame shown loaded in figure below is zero, and for that case give the displacements of node 2 and 3. All members have equal axial rigidity  $EA$ .

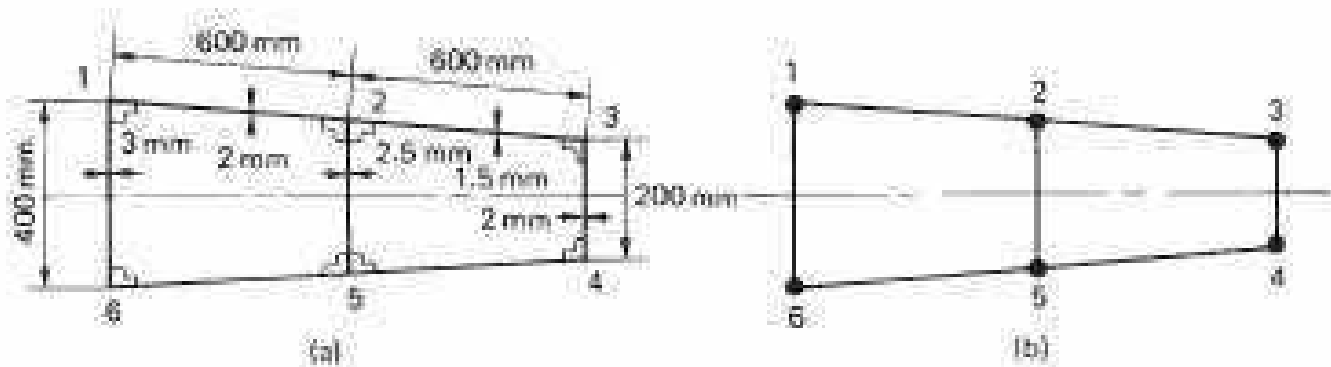


Given Data:

$$\begin{Bmatrix} F_{x,1} \\ F_{y,1} \\ F_{x,2} \\ F_{y,2} \\ F_{x,3} \\ F_{y,3} \end{Bmatrix} = \begin{bmatrix} [k_{11}] & [k_{12}] & [k_{13}] \\ [k_{21}] & [k_{22}] & [k_{23}] \\ [k_{31}] & [k_{32}] & [k_{33}] \end{bmatrix} \begin{Bmatrix} u_1 \\ v_1 \\ u_2 \\ v_2 \\ u_3 \\ v_3 \end{Bmatrix}$$

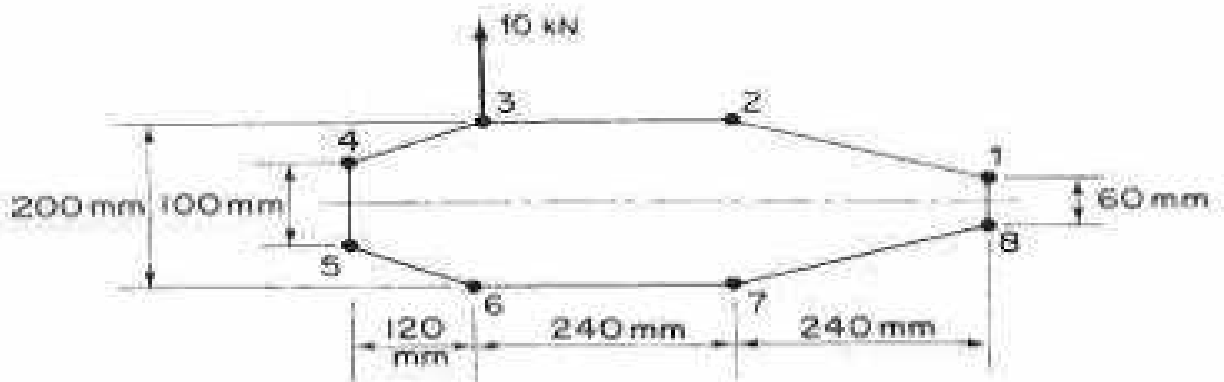
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- Q.6 a) Part of a wing section is in the form of the two-cell box shown in figure below in which the vertical spars are connected to the wing skin through angle sections all having a cross-sectional area of  $300\text{mm}^2$ . Idealize the section into an arrangement of direct stress-carrying booms and shear-stress-only-carrying panels suitable for resisting bending moments in a vertical plane. Position the booms at the spar/skin junctions.



10

- b) The thin-walled single cell beam shown in figure below has been idealized into a combination of direct stress carrying booms and shear stress only carrying walls. If the section supports a vertical shear load of  $10\text{kN}$  acting in a vertical plane through booms 3 and 6, calculate the distribution of shear flow around the section. Boom areas:  $B_1 = B_8 = 200\text{mm}^2$ ,  $B_2 = B_7 = 250\text{mm}^2$ ,  $B_3 = B_6 = 400\text{mm}^2$ ,  $B_4 = B_5 = 100\text{mm}^2$ .



Given data:

$$q_s = - \left( \frac{S_x I_{yy} - S_y I_{xy}}{I_{xx} I_{yy} - I_{xy}^2} \right) \left( \int_0^s t_D x \, ds + \sum_{r=1}^n B_r x_r \right) - \left( \frac{S_y I_{xx} - S_x I_{xy}}{I_{xx} I_{yy} - I_{xy}^2} \right) \left( \int_0^s t_D y \, ds + \sum_{r=1}^n B_r y_r \right) + q_{s0}$$

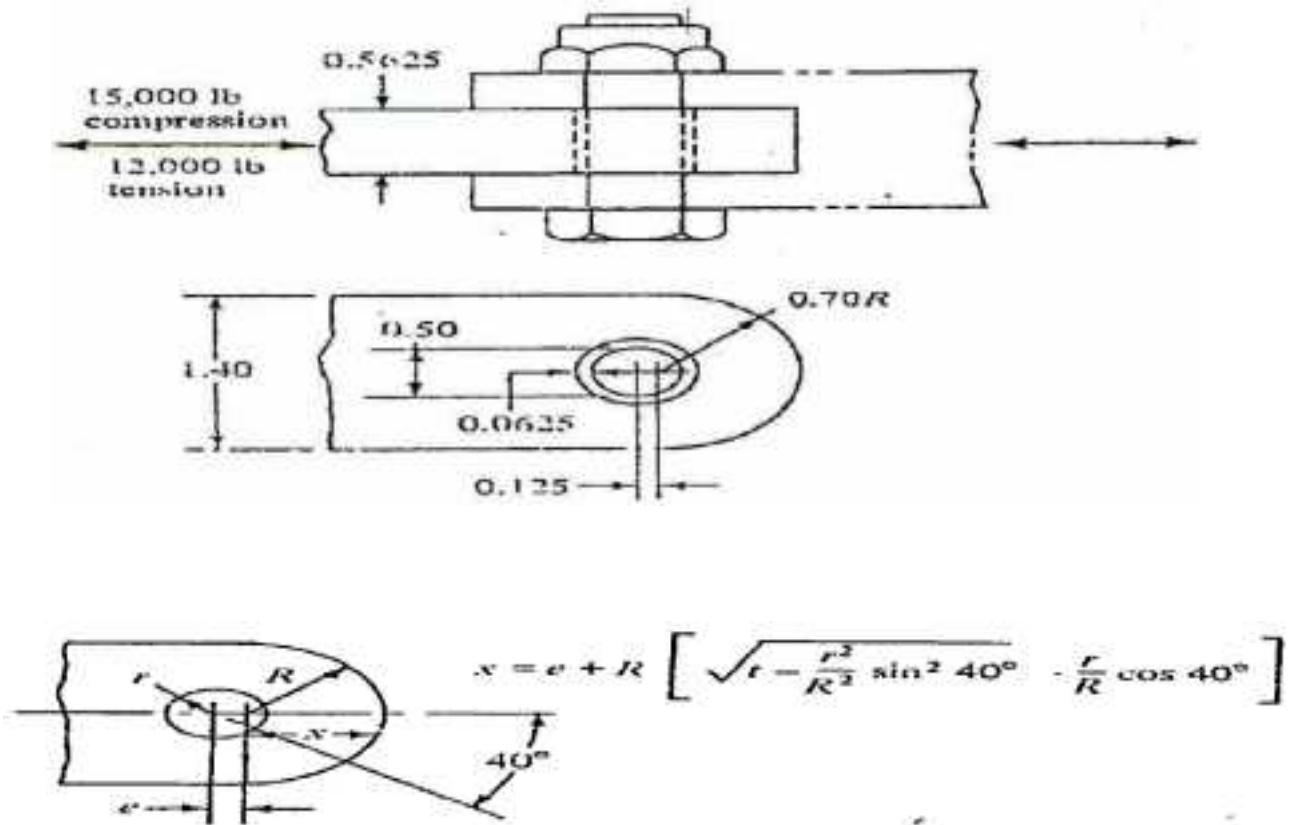
$$B_1 = \frac{t_D b}{6} \left( 2 + \frac{\sigma_2}{\sigma_1} \right)$$

$$B_2 = \frac{t_D b}{6} \left( 2 + \frac{\sigma_1}{\sigma_2} \right)$$

10

- Q.7 T1 of a 2014 aluminium forging, for which  $\sigma_{at} = 65000$ ,  $\tau_a = 39000$  and  $\sigma_{abr} = 98000 \text{ lb/in}^2$ . The bolt and bushing are made of steel for which  $\sigma_{at} = 125000$ ,  $\tau_a = 75000$  and  $\sigma_{abr} = 175000 \text{ lb/in}^2$ . The fitting resists limit or applied

loads of 15000-lb compression and 12000-lb tension. A fitting factor of 1.2 and a bearing factor of 2.0 are used. Find the margins of safety for the fitting for various types of failure.



For bolt and bushing (made of steel):

$$\sigma_{at} = 1.25 \times 10^6 \text{ lb/in}^2, \sigma_{abr} = 1.75 \times 10^6 \text{ lb/in}^2, \tau_a = 0.75 \times 10^6 \text{ lb/in}^2.$$

For fitting (made of aluminum):

$\sigma_{at} = 0.65 \times 10^6 \text{ lb/in}^2, \sigma_{abr} = 0.98 \times 10^6 \text{ lb/in}^2, \tau_a = 0.39 \times 10^6 \text{ lb/in}^2$ . Resisting load of fitting in compression is  $0.15 \times 10^6 \text{ lb}$  and  $0.12 \times 10^6 \text{ lb}$  in tension. Fitting factor is 1.2 and bearing factor is 2.0.

## End Semester Examination, May 2017

### B. Tech.—Fifth Semester FLIGHT MECHANICS-I (AE-504)

Time: 3 hrs.

Max Marks: **100**

No. of pages: **2**

Note: Attempt **FIVE** questions in all; **Q.1** is compulsory. Attempt **ANYTWO** questions from **PART-A** and **TWO** questions from **PART-B**. Each question carries equal marks.

(The common data for the numerical problems is given in the starting. Make use of given data values only, any other assumed values will not be credited.)

Common Data for the Numerical Problems:

- Value of acceleration due to gravity:  $9.81 \text{ m/s}^2$ .
- Ambient density at sea-level:  $1.225 \text{ Kg/m}^3$ .
- Ambient density at 5 Km altitude:  $0.7364 \text{ Kg/m}^3$ .
- Ambient density at 10 Km altitude:  $0.4135 \text{ Kg/m}^3$ .
- Speed of Sound at 15 degrees C:  $340 \text{ m/s}$ .

Q.1 Answer the following questions (**ANY TEN**):

- a) Explain the difference between geometric and geo-potential altitudes.
- b) Derive the hydrostatic equation.
- c) Explain the mechanism behind the measurement of airspeed in the airplane.
- d) Why there is a possibility that the Calibrated Airspeed of an aircraft may differ from the True Airspeed and the Ground Speed?
- e) Differentiate between total pressure and static pressure.
- f) What is induced drag?
- g) Define 'load factor'.
- h) What are effects of wing sweepback?
- i) What is the use of V-n diagram?
- j) What are the assumptions taken in finite wing theory?
- k) What are the conditions for maximum endurance of a jet powered airplane?

**2×10**

### PART-A

Q.2 A jet airplane with a weight of 452,420 N and wing area of  $100 \text{ m}^2$  has  $C_{L_{\max}}$  with flaps is 2.3. Obtain the take-off distance to 15 m screen height and the time taken for it.

Given that:  $V_1 = 1.16 V_s$ ,  $V_2 = 1.9 V_1$ ,

$C_d$  during ground run is 1.15,

Drag polar with landing gear and flaps deployed is  $C_D = 0.044 + 0.05 C_L^2$ ,

Thrust variation during take-off can be approximated as:  $T = 128,500 - 0.085 V^2$ ;

where  $V$  is in Km/h and  $T$  is in Newtons, and the aircraft takes-off place from a level, dry concrete runway ( $\mu = 0.02$  at sea level) .

**20**

- Q.3 a) On a certain day the pressure at sea level is 758 mm of mercury ( $101059 \text{ N/m}^2$ ) and the temperature is  $25^\circ\text{C}$ . The temperature is found to fall linearly with height to  $-55^\circ\text{C}$  at 12 Km and after that it remains constant up to 20 Km. Calculate the pressure, density and kinematic viscosity at 8 Km and 16 Km altitude. **15**
- b) Briefly explain any three high lift devices normally used in the aircraft. **5**

Q.4 A jet trainer is climbing in troposphere at a constant Mach number of 0.6. Obtain the rate of climb when it is climbing at an altitude of 5 km. The following data has been given about the airplane:

$W = 54,000 \text{ N}$ ,

$S = 17 \text{ m}^2$ ,

$C_D = 0.017 + 0.055 C_L^2$ ,

and thrust available at 5 km altitude =  $13,000 \text{ N}$ .

20

### **PART-B**

- Q.5 Consider a jet airplane with 20% of its weight as fuel fraction. It starts the cruise climb at an altitude of 11 Km. What will be the altitude at the end of cruise climb ( $h_f$ )?

Assuming  $V = 240 \text{ m/s}$ ,  $TSFC = 0.6$  and  $(C_L/C_D) = 16$ , estimate the range in cruise climb ( $R_{cc}$ ) What is the angle of climb ( $\gamma_{cc}$ ) in cruise climb? 20

- Q.6 a) Calculate the values of load factor in a level flight, free fall, in a turn of radius 200 m at a speed of 100 m/s and at the bottom of a loop of radius 200 m at a speed of 100 m/s? 10

- b) Obtain the maximum speed and minimum speed in steady level flight at sea-level for the following airplane:

$$W = 36,000 \text{ N};$$

$$S = 26.0 \text{ m}^2;$$

$$C_D = 0.032 + 0.043 C_L^2$$

$$BHP = 503 \text{ kW};$$

$$\text{Propeller efficiency} = 82\%;$$

$$C_{L_{\max}} = 1.5$$

10

- Q.7 An airplane stalls at  $M=0.2$  at sea level. What will be the Mach number and equivalent airspeed when it stalls at 5 km altitude? Compare the thrust required to maintain level flight near stall at the two altitudes. Assume the weight of the airplane to be same at the two altitudes. 20

# End Semester Examination, May 2017

## B. Tech.–Fifth / Sixth Semester AIRCRAFT SYSTEMS (AE-505)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q. 1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Attempt *any five* of the following:

- a) Explain briefly the function of a Frise aileron and a Fowler flap.
- b) List out the checks carried out on hydraulic fluid prior to its use in the aircraft. To ensure its fitness for use on the aircraft.
- c) Explain the need for and operation of in-flight refueling.
- d) Explain the concept of cabin altitude, cabin differential pressure and cabin rate of climb.
- e) Name two halogens that are permitted for use in fire extinguishers in an aircraft. What are halogen hydrocarbons and where are they used?
- f) What do you understand by 'solid oxygen'? Explain how it is utilized in aircraft. 4x5

### PART-A

- Q.2 a) Describe with the help of a schematic diagram, a typical fly-by-wire control systems used in an aircraft. 10
- b) What is the basic difference between cable control system and push-pull rod control system? Describe a typical cable control type flying control system used in an aircraft. 10
- Q.3 a) Explain the difference between a power-assisted and a power-operated control system. 10
- b) Explain the hydraulic operation of shimmy damper and anti-skid unit. 10
- Q.4 a) Draw a schematic diagram of fuel system suitable for a piston engine aircraft having minimum two fuel tanks, EDP, engine primer line and all other basic system components. Discuss the operation. 10
- b) Explain the purpose and function of different types of fuel feed systems and tank vent system used in aircraft fuel system. 10

### PART-B

- Q.5 a) Explain, with the help of a suitable system diagram, the function of air cycle air-conditioning system used in aircraft. 10
- b) What are the various air supply sources used for pressurization system in an aircraft? 10
- Q.6 a) Describe a demand type oxygen system that is used in aircraft. How is the availability of oxygen percentage increased in the aircraft passenger cabin with increase in altitude? 10
- b) What are the various cautionary steps observed while carrying out leak test and oxygen charging of gaseous oxygen? 10
- Q.7 a) Describe briefly different types of smoke, flame and carbon monoxide detectors which are used in transport aircraft. 10

- b) List out and discuss various maintenance checks that are carried out on extinguisher system? Name various types of life-saving equipment generally found in large transport aircraft. 10



**End Semester Examination, May 2017**  
**B. Tech. – Sixth Semester**  
**FLIGHT MECHANICS-II (AE-603)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

**Instructions:**

- Do not overstate your answers.
- Enumerate the equations wherever used in the derivations for quick reference.
- Use of calculator is permitted, however, sharing of calculator is not permitted.
- Do write the assumptions you are making while deriving an expression.

**Q.1 Answer *any five* of the following:**

- a) Explain the term stick-free neutral point.
- b) What is dihedral effect?
- c) Distinguish between sideslip and yaw.
- d) An aircraft with high wing has more longitudinal static stability than the one with low wing. Why?
- e) Explain the term stick-free neutral point.
- f) What is phugoid?

**4 × 5**

**PART-A**

- Q.2 a) Derive the expression for stick-fixed static stability for a conventional tailed aircraft. 10  
 b) Explain how the position of center of gravity decides the longitudinal static stability of the aircraft. Derive and explain the expression for the same. 10
- Q.3 Differentiate between pedal fixed and pedal free static directional stability and derive the expression. 20
- Q.4 Derive and explain the contribution of power, wing-body and vertical tail in the directional static stability of the aircraft. 20

**PART-B**

- Q.5 a) Write short notes on the following:  
 i) Elevons and V-tails.  
 ii) Rolling moment due to aileron. 5x2  
 b) Distinguish between aerodynamic balancing and mass balancing. 5  
 c) Explain how wing dihedral and wing sweep contributes to the dihedral effect. 5
- Q.6 a) Analyze and hence derive the expression for the spring-mass-damper system and discuss the conditions for overdamped, underdamped and critically damped system. 12  
 b) Write analytical expressions for the following referring to above question:  
 i) Period of oscillation.  
 ii) Damping frequency.  
 iii) Number of cycles to damp to 1/n times the initial amplitude.  
 iv) Time to damp to 1/n times the initial amplitude. 8
- Q.7 a) Differentiate between short period and long period modes of an airplane. Explain if phugoid is a short period or long period mode. 10  
 b) Explain the difference between static and dynamic stability in terms of an airplane. 10

# End Semester Examination, May 2017

## B. Tech. – Sixth Semester AIRCRAFT DESIGN (AE-604)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer (*any five*) of the following:

- Write the definition of 'Design'.
- Distinguish between wetted area and the reference area.
- What do you understand by 'multi-bogey landing gear'?
- What is canard?
- What is the lift distribution profile for an elliptical shaped wing?
- Draw a typical drag polar.
- Draw a mission profile including combat.
- What is taper ratio of a wing; compare the taper ratio of swept and un-swept wing, all other things remaining the same.
- What is a Sears-Haack body?
- During a design 56, 49, 65, 104 and 27 were calculated for wing loading what value should be chosen for proceeding. 4 × 5

### PART-A

- Q.2 a) Describe the Aircraft conceptual design process with 'Design Wheel' and flow charts. Argue the case of the Designer being as much a specialist as an Aerodynamicist or Propulsion engineer. 10
- b) Describe the method of aircraft gross take-off weight calculation during the preliminary design. (hint: empty and fuel weight fractions). 10
- Q.3 a) Describe the various landing gear arrangements. 6
- b) Compare the tricycle and tail dragger arrangements; explain the advantage with the former. 7
- c) Describe the functioning of an Oleo Shock Absorber and prove that its stroke length is independent of aircraft weight term. 7
- Q.4 a) What are thrust loading and wing loading? Do these remain constant during the flight of an aircraft? List the mission segments for which these are independent of each other and the segments for which they are related. What is done in cases where these are related? Describe the method for computing the thrust loading during initial sizing of the aircraft. 10
- b) Derive the equation for the wing loading for sustained turn and climb. 10

### PART-B

- Q.5 a) Describe the more refined method of determining the gross take-off weight and empty weight fraction and fuel weight. 6
- b) Derive the expression for L/D for cruise and loiter required to compute the weight ratio for jet as well as propeller aircraft. 7
- c) Describe the method for weight ratio during combat for a known time. 7
- Q.6 a) Derive expression for weight ratios for 'cruise' and 'loiter' for a jet as well as propeller aircraft. How is the (L/D) ratio found? 10

- b) Derive the relations between  $C_{D0}$  and  $C_{Di}$  for minimum thrust and minimum power and prove  $(L/D)_{\min \text{ power}} = 0.866 (L/D)_{\min \text{ thrust}}$ . 10

- Q.7 a) Discuss, with the help of suitable sketch, the inlet location for the buried and the podded engines. 7
- b) How to scale-up (length, diameter and weight) your design engine from an existing nearest one? 6
- c) What is 'carry through' structure? Describe structural concepts for fuselage and preferred integration of fuselage and wing. 7

**End Semester Examination, May 2017**  
**B. Tech. – Sixth Semester**  
**INTRODUCTION TO ORBITAL MECHANICS (AE-607)**

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

**Q.1 Answer any five of the following:**

- a) Comparison of Hohmann transfer and bielliptic transfer.
- b) Argument of latitude.
- c) Inclination of the orbits and classification of the orbits on the basis of orbital inclination.
- d) Simple impulse maneuvers.
- e) Elliptical transfer orbits.
- f) Plane change maneuvers.

4 × 5

**PART-A**

**Q.2 Obtain the rotation matrix R for the given sequence of Euler angles successive principle rotations:**

- i) A rotation  $\psi = 12^\circ$  about the original x-axis
- ii) A rotation  $\vartheta = 22.5^\circ$  about the intermediate y-axis
- iii) A rotation  $\phi = 45^\circ$  about the transformed x-axis

Derive the expression for the angular velocity,  $\omega$  in terms of Euler angle rates, considering the Euler angles as  $\psi$ ,  $\vartheta$ , and  $\phi$  along the three axes, respectively. 20

**Q.3 Derive the expression for angular momentum for a system of 10 particles and using the generalization, obtain the expression for the angular momentum for a rigid body. 20**

**Q.4 Derive the expression for translational kinetic energy for a rigid body. Express the rotational kinetic energy in terms of moment of inertia about the center of mass of the rigid body. State the Kepler's laws of planetary motion and derive Kepler's second and third law for an elliptical orbit. 20**

**PART-B**

**Q.5 a) The position and velocity vectors of a satellite in ECI frame are stated as:**

$$\mathbf{r} = \langle 6242, 15, 20 \rangle \text{ km}$$

$$\mathbf{v} = \langle 1.8, 1.5, 0 \rangle \text{ km/s}$$

Express the position and velocity vectors of the above satellite in terms of classical orbital elements. 10

- b) A satellite is initially in a low-Earth circular orbit of radius 6778.14 km and needed to be transferred into a high-Earth orbit of radius 80,658 km radius, such that the angle between the orbital planes of the two orbits is  $35^\circ$ . Find the most efficient transfer for the above process and total velocity impulse required.

Given data:  $\mu_{\text{Earth}} = 398600.4 \text{ Km}^3/\text{s}^2$ , radius of third transfer orbit in case of bi-elliptical transfer = 120,000 km, radius of Earth = 6378.14 km. 10

**Q.6 a) A spacecraft's dry mass is 85,000 kg and the effective exhaust gas velocity of its main engine is 3,500 m/s. How much propellant must be carried if the propulsive system is to produce a total  $\Delta v$  of 800 m/s? 10**

- b) A two-stage rocket has the following masses:

1st stage propellant mass: 125,000 kg

2nd stage propellant mass: 32,000 kg

1st stage dry mass: 9,200 kg

2nd stage dry mass: 3,200 kg

Payload mass: 3,000 kg

The specific impulse for the first and second stages are 260 s and 320 s, respectively. Calculate the rocket's total  $\Delta v$ . 10

Q.7 Write a short note on the Mars Science Laboratory. 20

**End Semester Examination, May 2017**  
**B. Tech.–Sixth Semester**  
**VIBRATIONS AND AEROELASTICITY (AE-801)**

Time: 3 hrs

Max Marks: 100

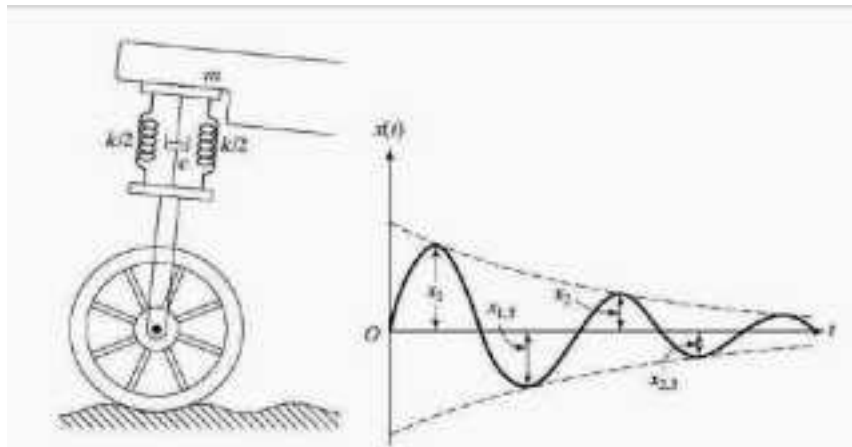
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.

- Q.1
- Define 'forced vibration'.
  - A vibratory system has amplitude of  $10X_0$ , where  $X_0$  is reference amplitude. Express above quantity in decibel(dB).
  - What is hysteresis damping?
  - Write differential equation of forced vibration with viscous damping.
  - What is the application of Rayleigh Energy Method?
  - Find transverse stiffness of bar/rod.
  - What is physical significance of under-damped system?
  - What are generalised coordinates?
  - What is divergence?
  - What is control reversal?
- 2x10

**PART-A**

- Q.2 An underdamped shock absorber is to be designed for a motorcycle of mass 200 kg shown in the figure.



When the shock absorber is subjected to an initial vertical velocity due to a road bump, the resulting displacement-time curve is to be as indicated in figure. Find the necessary stiffness and damping constants of the shock absorber if the damped period of vibration is to be 2 s and the amplitude  $x_1$  is to be reduced to one-fourth in one half

cycle i.e.  $x_{1.5} = x_1/4$ . Also find the minimum initial velocity that leads to a maximum displacement of 250 mm.

20

- Q.3
- Derive the response equation for critically damped system with spring-mass-damper. Show vector addition of all these forces. Draw the response curve. 10
  - For a spring-mass-damper system,  $m=50\text{kg}$  and  $k=5000\text{N/m}$ . Find damped natural frequency when  $C = C_c/2$ . 10
- Q.4
- Write differential equation for 2-Dof system for forced vibration in detail starting

with free body diagram.

10

- b) Find the natural frequencies and mode shapes of a spring-mass system for 2-DoF system which is constrained to move in the vertical direction only. Take  $m_1 = m_2 = m$  and  $k_1 = k_2 = k_3 = k$ .

10

### **PART-B**

Q.5 What is divergence speed? Derive expression for divergence speed,  $V_2$  for finite wing. 20

Q.6 a) How is flutter speed determined experimentally? 10

- b) Find the  $X$  and  $\Phi$  of a single-degree-of-freedom system with  $m=10\text{kg}$ ,  $c=20\text{N-s/m}$ ,  $k=4000\text{N/m}$  under An external force  $F(t) = 100\text{N} \cos 10t$ . 10

Q.7 a) How does buffeting differ from flutter? What are different types of flutter phenomena? 10

b) What are quality factor and bandwidth? 4

- c) A motor vehicle can vibrate in the vertical direction while traveling over a rough road. The vehicle has a mass of 1200 kg, the suspension system has a spring constant of 400 kN/m and a damping ratio of  $\zeta=0.5$ . If the vehicle speed is 20 km/hr, determine the displacement amplitude of the vehicle. The road surface varies sinusoidally with an amplitude of  $Y=0.05\text{m}$  and a wavelength of 6 m. 6

**End Semester Examination, May 2017**  
**B. Tech.–SeventhSemester**  
**BOUNDARY LAYER THEORY(AE-802)**

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

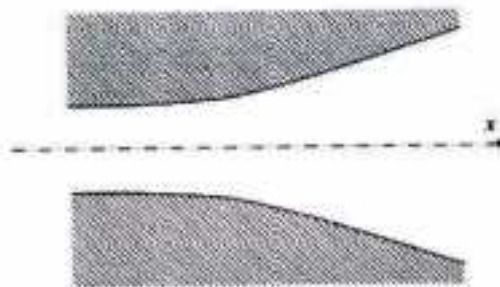
Q.1 Answer the following questions:

- a) Explain shape factor with relevant significance.
- b) What is the difference between exact solution and approximate method?
- c) Give an expression for Pohlhausen dimensionless quantity ( $\eta$ ) and define it with its physical interpretation for two dimensional flows.
- d) Explain the physical significance with formula of i) Prandtl Number ii) Eckert Number.
- e) Define 'forced and free flow on the basis of dimensionless numbers'.
- f) Explain briefly the effect of transition over shape factor.
- g) Write a short note on asymptotic suction profile.
- h) Explain the method of cooling of gas to control boundary layer control.
- i) Define 'laminar sub-layer'.
- j) What are Reynolds's stresses and explain its importance?

2x10

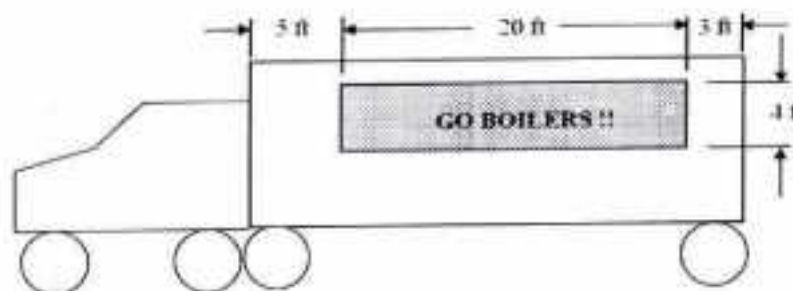
**PART-A**

- Q.2 a) A wind tunnel has a test section of cross section  $1m^2$  and length 6 m. Air at  $20^\circ C$  flows through it at an average velocity of 30m/s. To account for the growing boundary layer, the walls are slanted slightly outward. At what angle should the walls be slanted between  $x=2m$  and  $x=4m$  to keep the test section velocity constant? Explain all the assumptions and boundary conditions with the help of diagrams and nomenclatures.



10

- b) A thin smooth signboard is attached to the side of a truck as shown. The flow is assumed to be parallel, laminar and steady with no pressure gradient.
- i) Estimate the skin friction drag on the signboard when the truck speed is 55 mph.
  - ii) At what distance there will be a separation of flow on the side of the truck.



10



- Q.3 Obtain a method for approximate solution for the flow past a flat plate at zero incidence using the momentum equation where the flow is incompressible and laminar. Compare the solution with the exact solution obtained by Blasius in terms of shear stress, drag and shape factor when the velocity profile is given as a function:

$$f(\eta) = \frac{3}{2}\eta - \frac{1}{2}\eta^3$$

Explain all the assumptions and boundary conditions with the help of diagrams and nomenclatures. 20

- Q.4
- a) Simplify the Navier-stokes equation, using thermal boundary layer assumptions. 5
  - b) Derive the basic energy equation, using the first law of thermodynamics. 5
  - c) Explain how and under what condition, Eckert number behaves like Mach number? 5
  - d) Explain theoretically the effect of Prandtl number over the two boundary layers i.e. velocity boundary layer and thermal boundary layer. Explain the general properties of thermal boundary layer over the adiabatic wall. Explain all the assumptions and boundary conditions with the help of diagrams and nomenclatures. 5

### **PART-B**

- Q.5
- a) Derive the Navier – Stroke equations for the method of small disturbances for the three dimensional disturbances; i.e.  $U; V; W \neq 0$ . 6
  - b) Derive and explain why Orr – sommerfeld equation is valid for two dimensional flow. Explain all the assumptions and boundary conditions with the help of diagrams and nomenclatures. 4
  - c) Derive and explain the possible methods to obtain a solution for the stability of the flow as obtained in Orr –sommerfeld equation for three – dimensional flow? 5
  - d) Explain the limit of stability by eigen-values and general properties of Orr – sommerfeld equation. 5
- Q.6
- a) Explain the following methods of boundary layer control:
    - i) Injection of different gas
    - ii) Suction 5
  - b) Derive the fundamental equations of boundary layer suction with the help of diagram and obtain a theoretical result using the exact solution method over the flat plate with continuous distribution of suction on plate with incompressible flow. The suction velocity of the flow is to be treated as the function of boundary layer thickness. Explain all the assumptions and boundary conditions with the help of diagrams and nomenclatures. 15
- Q.7
- a) Explain the concept of Reynold's stresses with the momentum flux. 5
  - b) Explain the theoretical assumptions for the calculation of turbulent flows given by Prandtl's mixing length theory and Von Karman's similarity hypothesis. Explain their advantages and disadvantages over each other to obtain Universal velocity distribution law. Explain all the assumptions and boundary conditions with the help of diagrams and nomenclatures. 15

**End Semester Examination, May 2017**  
**B. Tech.-Seventh Semester**  
**ROCKET PROPULSION (AE-821)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Answer the following briefly:

- a) Explain the general thrust equation for a rocket engine.
- b) Define the terms: specific impulse, mass ratio, thrust coefficient, and effective exhaust velocity.
- c) What kinds of rockets are used as vernier rockets? Discuss briefly how they function.
- d) What do you understand by internal ballistics of rockets?
- e) How are thrust augmentations and thrust termination achieved in rockets? 2×10

**PART-A**

- Q.2
  - a) Differentiate between the conical nozzles and the contoured nozzles and discuss their applications. What do you understand by the term characteristic velocity? 10
  - b) Discuss the flow through a convergent-divergent nozzle. What are the under-expanded and over-expanded modes of these nozzles? 10
- Q.3
  - a) With the help of suitable sketches, describe various kinds of solid propellant grain configurations, which provide neutral burning, progressive burning and regressive burning. 12
  - b) Discuss various kinds of solid propellants, their characteristics and applications. 8
- Q.4
  - a) Write notes on the following with suitable examples of each:
    - i) Insulation and inhibition of propellants.
    - ii) Ablative liners.
    - iii) Propellant casting.
    - iv) Hybrid propulsion. 3×4
  - b) Discuss construction details of a typical rocket system and how the ignition is achieved in such a rocket. What are the booster rockets? 8

**PART-B**

- Q.5
  - a) Discuss a typical liquid rocket system that is currently being used by ISRO. Describe the properties of propellants used and the specific impulse obtained. 10
  - b) Write briefly on thrust magnitude control and cooling of rocket nozzles. 8
- Q.6
  - a) Describe the process of combustion in a liquid rocket engine. 6
  - b) Describe briefly the normally used cryogenic engines, the propellants used, their handling and performance characteristics. 10
  - c) Describe briefly various kinds of injectors used in liquid rocket engines. 4
- Q.7
  - a) Describe how the nuclear, electrical and photon rocket propulsion systems works and their applications. 15
  - b) Write short note on 'magneto-plasma jet'. 5

**End Semester Examination, May 2017**  
**B. Tech.–SeventhSemester**  
**FLIGHT DYNAMICS(AE-824A)**

Time: 3 hrs

Max Marks:100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

Q.1 Answer (*any ten*) of the following questions:

- a) Define 'static and dynamic stability'.
- b) Distinguish between stick-fixed and stick-free longitudinal stability.
- c) What are the conditions for longitudinal static stability and longitudinal control?
- d) How is wing dihedral used for lateral stability?
- e) What is a phugoid oscillation?
- f) What is the function of trim tab?
- g) Define the body axes system.
- h) Describe spiral divergence.
- i) What is meant by Dutch Roll?
- j) Define 'observability of a linear time-invariant system'.
- k) Define 'controllability of a linear system'.

2x10

**PART-A**

Q.2 An airplane has the following characteristics:

$$C_{L\alpha w} = 0.082 \text{ deg}^{-1}, C_{Lat} = 0.055 \text{ deg}^{-1}, \left( \frac{dC_L}{d\delta_e} \right) = 0.032, C_{hat} = -0.003 \text{ deg}^{-1}, C_{h\delta t} = -0.0045,$$

$$i_w = 0, \alpha_{0L} = -20, i_t = -10, \varepsilon = 0.5\alpha, S_t = 0.25 S, l_t = 3c, (W/S) = 1500 \text{ N/m}^2$$

$$\text{Location of aerodynamic center} = 0.25C, \eta = 1.0, (C_{ma})_{f,n,p} = 0.37 \text{ rad}^{-1}.$$

Obtain stick-fixed neutral point, stick-free neutral point, stick-free neutral point when  $C_{hat}$  is changed to 0.003. 20

Q.3 A model of an airplane is tested in a wind tunnel without the vertical tail. Contributions of various components give  $C_{n\beta} = -0.0012 \text{ deg}^{-1}$ . If the vertical tail is to be positioned at a point on the aft end of the fuselage giving a tail length of 4.8 m, how much vertical tail area is required to give an overall  $C_{n\beta} = 0.0012 \text{ deg}^{-1}$ . Assume that the vertical tail would have an effective aspect ratio of 2, the wing area is  $18 \text{ m}^2$ , wing span is 10.6m and the wing is set at the middle of the fuselage. 20

Q.4 a) Define the term maneuver point stick-fixed and maneuver point stick-free. Explain why for a given value of  $C_L$  the elevator deflection required in pull-up is more than that in a steady level flight. 10

b) An airplane is equipped with a wing of aspect ratio 6 ( $C_{l\alpha w} = 0.05$ ) and span efficiency factor  $e$  of 0.90, with an airfoil section giving  $C_{mac} = 0.02$ . Calculate, for  $C_L$  between 0 and 1.5, the pitching moment coefficient of the wing about the center of gravity which is located 0.05c ahead of the aerodynamic center and 0.06c under aerodynamic center. Repeat the calculations when chord wise force component is neglected. Assume  $C_{D0w} = 0.008, \alpha_{0Lw} = 1^\circ, i_w = 5^\circ$ . 10

**PART-B**

**Q.5** The approximate form of Dutch roll mode can be described in the state-space form as:

$$\begin{bmatrix} \Delta\beta \\ \Delta r \end{bmatrix} = \begin{bmatrix} Y_\beta / u_0 & \frac{Y_r}{u_0} + 1 \\ N_\beta & N_r \end{bmatrix} \begin{bmatrix} \Delta\beta \\ \Delta r \end{bmatrix} + \begin{bmatrix} Y_{\delta r} / u_0 \\ N_{\delta r} \end{bmatrix} \Delta\delta_r$$

It is given that,  $Y_\beta = -2.6 \text{ ms}^{-2}$ ,  $N_r = -0.34 \text{ s}^{-1}$ ,  $Y_{\delta r} = -1.572 \text{ ms}^{-2}$ ,  $Y_r = 0.741 \text{ ms}^{-1}$ ,  
 $u_0 = 51.33 \text{ ms}^{-1}$ ,  $N_{\delta r} = 0.616 \text{ s}^{-2}$ , and  $N_\beta = 0.64 \text{ s}^{-2}$ .

- i) Examine the stability of the motion.
- ii) Obtain the period of oscillatory mode and the time to damp to half amplitude. 20

**Q.6** Consider the control system given by the following state – space equation:

$$\dot{x} = Ax + Bu \text{ and } y = Cx + D$$

where,

$$A = \begin{bmatrix} 1.05 & 3.10 & 1.00 \\ 4.00 & -3.20 & 0.75 \\ -2.50 & 0.00 & 1.00 \end{bmatrix}, B = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}, C = [1 \quad 1 \quad 1], D = 0$$

$x$  is the state-vector and  $u$  is the control input.

- i) Check if the system is controllable and observable.
- ii) Comment on the stability of the system by giving proper justification.
- iii) Design a full-state feedback controller for the above system so that, the final closed loop system has poles at  $s = -1$ ,  $s = -0.5$  and  $s = -5$ . 20

**Q.7** Derive the approximate equations of aircraft longitudinal dynamics using small perturbation theory. 20

**End Semester Examination, May 2017**  
**B. Tech.–SeventhSemester**  
**INTRODUCTION TO WIND ENERGY(AE-825)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) Draw a sketch of diffuser and concentrator.
  - b) What is Hadley cell?
  - c) Derive the expression for power contained in wind.
  - d) State Betz limit.
  - e) Draw power vs wind speed showing cut in wind speed and rated power.
  - f) What are ducted systems?
  - g) What do you mean by interconnected systems?
  - h) How is noise intensity measured?
  - i) What is energy payback time?
  - j) Draw capital cost per rated kilowatt vs rated output for installed system and wind machines only. 2x10

**PART-A**

- Q.2
- a) List the advantages HAWTs. 10
  - b) What is solidity? State the requirement for low solidity and high solidity wind machines. 10
- Q.3
- a) Draw wind forces and velocity diagram for HAWT rotor blades. Explain the concept behind rotation of blades in particular direction in the presence of wind. 10
  - b) Why are rotor blades twisted? 5
  - c) What are the factors on which power and energy from wind turbines depend? 5
- Q.4
- a) Maximum power extracted by any WECS from wind has certain limit. What is it called? Derive an expression for maximum extractable power. 15
  - b) How can we improve output performance of HAWT? 5

**PART-B**

- Q.5
- a) Explain use of wind energy for direct heat application. 10
  - b) How do wind characteristics matter for site selection? 10
- Q.6
- Explain environmental impact of wind machines in detail. 20
- Q.7
- a) How does wind availability affects system design objectives? 6
  - b) What are the advantages of small, decentralized wind energy system? 6
  - c) What are important parameters that determine the cost of wind energy produced? 8

**End Semester Examination, May 2017**  
**B. Tech.–SeventhSemester**  
**PRINCIPLES OF HELICOPTER ENGINEERING(AE-826)**

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1 a) Briefly explain the basic parts of the helicopter.  
 b) Define solidity and its effects.  
 c) Explain the vortex ring state.  
 d) Explain the concept of autorotation.  
 e) What is the advantage of ground effect?

4x5

**PART-A**

- Q.2 a) With the help of a hinge arrangement, show the flapping, lagging and feathering motion and briefly explain the importance of each motion. 10  
 b) Derive the equation of lagging motion by assuming the flapping angle to be zero and the blade moving forward on the drag hinge through angle  $\xi$ . Refer the diagram shown as shown below.



10

- Q.3 a) In actuator-disc analysis why do we assume that the rotor has infinite number of blades? Explain. 10  
 b) Explain the ground effect on the lifting rotor with the help of relevant diagrams. 10
- Q.4 a) Derive the characteristic equation for longitudinal dynamic stability using all the assumptions. 10

Given:

$$\begin{aligned} \frac{du}{d\tau} - x_u u - x_w w - x_q \frac{d\theta}{d\tau} + w_c \theta \cos \tau_c &= x_{B1} B_1 + x_{\theta o} \theta_o \\ -z_u u + \frac{dw}{d\tau} - z_w w - \left( \hat{V} + z_q \right) \frac{d\theta}{d\tau} + w_c \theta \sin \tau_c &= z_{B1} B_1 + z_{\theta o} \theta_o \\ -m_u u - m_w w - m_q \frac{dw}{d\tau} + \frac{d^2 \theta}{d\tau^2} - m_q \frac{d\theta}{d\tau} &= m_{B1} B_1 + m_{\theta o} \theta_o \end{aligned}$$

- b) The longitudinal derivatives for the hovering case (c.g. on shaft axis) are:

$$x_u = -0.032, x_w = 0, x_q = 0$$

$$z_u = -0, z_w = -0.52, z_q = 0$$

$$m'_u = 0.016, m'_w = 0, m'_q = -0.099$$

Given:  $\mu^* = 47.6, \hat{t} = 1.82 \text{ seconds}, w_c = 0.0856 \text{ and } i_B = 0.11$

$$m_u = 6.8, m_w = 0, m_q = -0.90$$

Calculate the time to halve amplitude and time to double amplitude. Also comment on the stability characteristics. 10

**PART-B**

- Q.5 a) What is the advantage of an electromechanical device over the stabilizing bar? 10  
 b) Explain in detail the control response with the help of  $B_1$  derivative. 10

- Q.6 Explain any one type of active control of vibration. 20

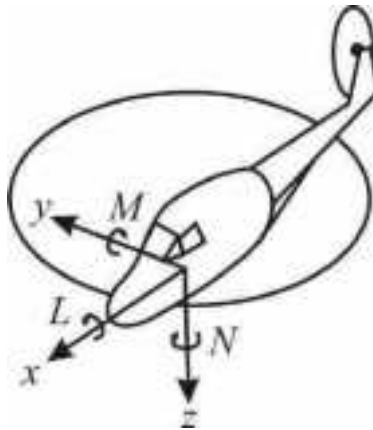
- Q.7 a) The exciting forces i.e. hub forces and moments from each blade can be resolved into force components X, Y, Z and moment components L, M, N relative to fixed axes in the helicopter. With the help of the information provided, show that:

$$X = -\frac{1}{2}b \sum_{m=1}^{\infty} [P_{mb-1} + T_{mb-1} + P_{mb+1} - T_{mb+1}] \cos mb\varphi$$

$$-\frac{1}{2}b \sum_{m=1}^{\infty} [Q_{mb-1} - S_{mb-1} + Q_{mb+1} + S_{mb-1}] \sin mb\varphi$$

Given: azimuth angle of  $k^{\text{th}}$  blade,  $\varphi_k = \varphi + 2\pi k/b$

$$X_k = -R_{1k} \cos \varphi_k + R_{2k} \sin \varphi_k$$



10

- b) Why elimination or reduction of vibration is important? Explain. 10

**End Semester Examination, May 2017**  
**B. Tech.–SeventhSemester**  
**PRINCIPLES OF HELICOPTER ENGINEERING(AE-826)**

Time: 3 hrs

Max Marks: 100

No. of pages: 2

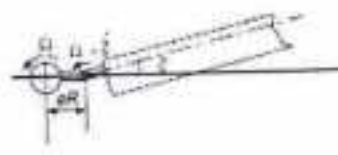
Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

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 d) Explain the concept of autorotation.  
 e) What is the advantage of ground effect?

4x5

**PART-A**

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 b) Derive the equation of lagging motion by assuming the flapping angle to be zero and the blade moving forward on the drag hinge through angle  $\xi$ . Refer the diagram shown as shown below.



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- b) The longitudinal derivatives for the hovering case (c.g. on shaft axis) are:

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$$z_u = -0, z_w = -0.52, z_q = 0$$

$$m'_u = 0.016, m'_w = 0, m'_q = -0.099$$

Given:  $\mu^* = 47.6, \hat{t} = 1.82 \text{ seconds}, w_c = 0.0856 \text{ and } i_B = 0.11$

$$m_u = 6.8, m_w = 0, m_q = -0.90$$

Calculate the time to halve amplitude and time to double amplitude. Also comment on the stability characteristics. 10



**PART-B**

- Q.5 a) What is the advantage of an electromechanical device over the stabilizing bar? 10  
 b) Explain in detail the control response with the help of  $B_1$  derivative. 10

- Q.6 Explain any one type of active control of vibration. 20

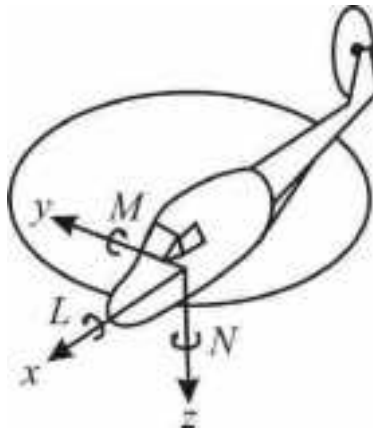
- Q.7 a) The exciting forces i.e. hub forces and moments from each blade can be resolved into force components X, Y, Z and moment components L, M, N relative to fixed axes in the helicopter. With the help of the information provided, show that:

$$X = -\frac{1}{2}b \sum_{m=1}^{\infty} [P_{mb-1} + T_{mb-1} + P_{mb+1} - T_{mb+1}] \cos mb\varphi$$

$$-\frac{1}{2}b \sum_{m=1}^{\infty} [Q_{mb-1} - S_{mb-1} + Q_{mb+1} + S_{mb-1}] \sin mb\varphi$$

Given: azimuth angle of  $k^{\text{th}}$  blade,  $\varphi_k = \varphi + 2\pi k/b$

$$X_k = -R_{1k} \cos \varphi_k + R_{2k} \sin \varphi_k$$



10

- b) Why elimination or reduction of vibration is important? Explain. 10

**End Semester Examination, May 2017**  
**B. Tech.–Sixth Semester**  
**BASICS OF COMPUTATIONAL FLUID DYNAMICS(AE-827)**

Time: 3 hrs.

Max Marks:100

No. of pages:2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

Q.1 *Answer (any five) of the following briefly:*

- a) What is the physical principle of the continuity equation? Write the different forms of continuity equation.
- b) Explain the difference between the conservation form and the non-conservation forms of equations
- c) Define Jacobian and discuss its mathematical forms.
- d) Plot the discrete checkerboard velocity distribution.
- e) Define:
  - i) Length scale ratio,
  - ii) Velocity scale ratio,
  - iii) Turbulent Prandtl number
  - iv) Turbulence kinetic energy.
- f) Explain the concept of staggered grid. 4 × 5

**PART-A**

- Q.2 a) What are the different kinds of forces that can occur on a moving fluid element? Derive a 3D momentum equation for a viscous flow in conservation form. 12
- b) How do we arrive at the Euler Equations from the Navier-Stokes equations? 8
- Q.3 a) Write the finite difference representation of the following:
  - i) First order forward difference for first partial derivative.
  - ii) First order rearward difference for first partial derivative.
  - iii) Second order central difference for first partial derivative.
  - iv) Second order central difference for second partial derivative. 2 × 4
- b) Explain the explicit and implicit approaches followed in CFD with examples. 4
- c) Differentiate between the discretization error and the round-off error. 8

- Q.4 a) Consider the continuity equation in Cartesian coordinates for steady viscous flow over a flat plate representing the physical plane  $(x, y)$ :

$$\frac{\partial(pu)}{\partial x} + \frac{\partial(pv)}{\partial y} = 0$$

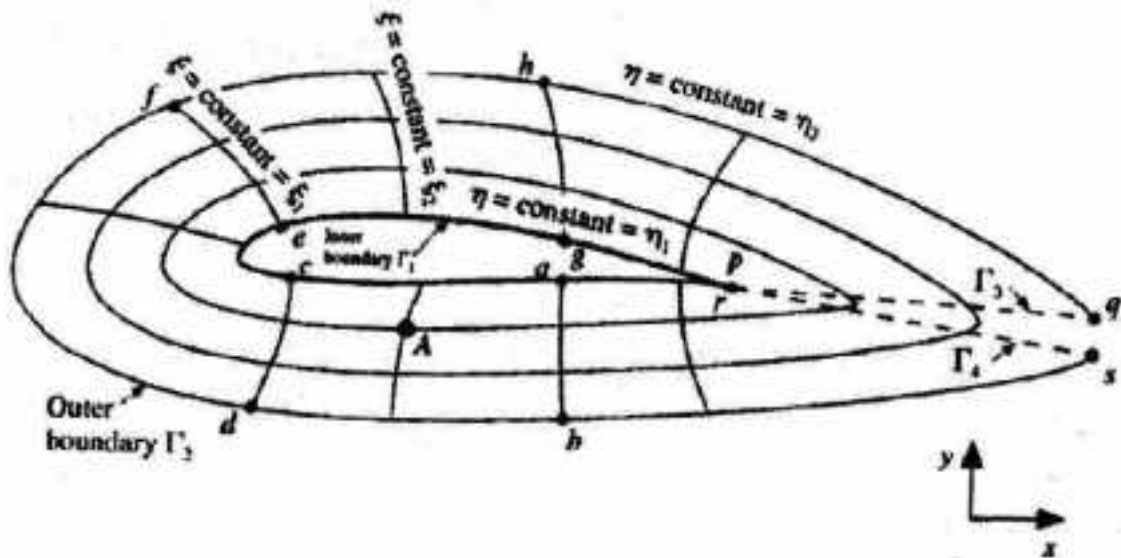
Transform this equation into computational plane  $(\xi, \eta)$  using the transformation:

$$\xi = x; \eta = \ln(y + I)$$

What type of grid-generation technique is represented by the above case? 10

- b) Describe the metrics and Jacobian determinants that are used in the transformation process in CFD applications. 5

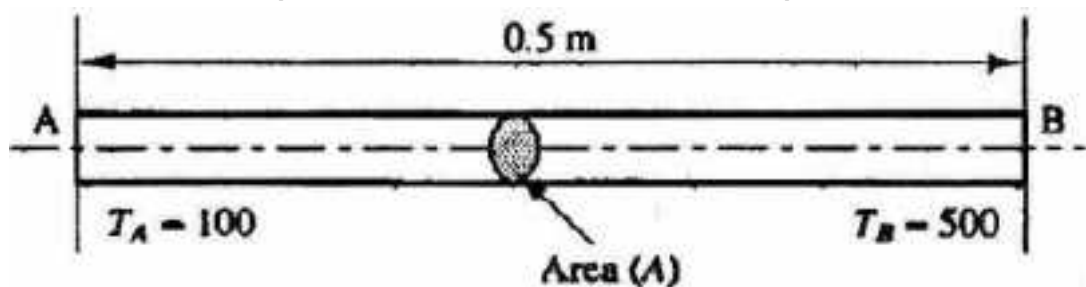
- c) Discuss the transformation of a curvilinear grid as shown in the figure into a uniform grid in computational plane.



5

### PART-B

- Q.5 a) Starting with an unsteady two-dimensional, inviscid flow and assuming no body force and no volumetric heat addition, discuss the procedure showing the essence of the Lax-Wendroff technique. 12
- b) Plot the computational modules for the x-momentum equation and y-momentum equation showing the control volume in each case, as used in the pressure correction method. 8
- Q.6 a) Discuss the one-dimensional application of the finite volume method to the solution of the simple diffusion problem involving conductive heat transfer as shown in Fig. This is source-free heat conduction in an insulated rod whose ends are maintained at constant temperatures of  $100^\circ\text{C}$  and  $500^\circ\text{C}$  respectively. Cross-sectional area  $A = 10 \times 10^{-3}\text{m}^2$ , thermal conductivity  $k = 1000\text{ W/mk}$ . Derive the set of algebraic equations in terms of steady-state temperature for five different nodes of the problem domain. Write the set of equations in matrix form. 14



14

- b) Define conservativeness, boundedness and transportiveness. 6

- Q.7 a) Discuss Prandtl's mixing length model of turbulence. 8
- b) Define eddy viscosity. Discuss the transport equations for standard k-ε model of turbulence. 12

**End Semester Examination, May 2017**  
**B.Tech. -Third / Fourth Semester**  
**BASICS OF AUTOMOBILE ENGINEERING (AU-405)**

Time: 3 hrs

Max Marks:100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer in brief:

- a) What is aspect ratio of a tyre?
- b) What is tyre bead?
- c) What is alternator?
- d) What is transfer box?
- e) What are the salient feature of saloon car?
- f) Define 'stroke length and top dead centre'.
- g) Where are multiplate clutches used and why?
- h) What is the function of torsional springs in friction plate?
- i) What is scrub radius?
- j) What do you mean by bleeding of hydraulic brakes? 2x10

**PART-A**

- Q.2 a) Draw a schematic diagram showing the layout of the transmission system of a rear wheel driven car and explain the importance of each component? 10
- b) On a hilly track performance of rear wheel drive vehicle is superior as compared to the front wheel type vehicles. Explain the reason for the same. 5
- c) Discuss various styles of carbodies giving example. 5
- Q.3 a) With the help of neat sketch explain the functioning of M.P.F.I. system used in the cars? 10
- b) With the help of neat sketch explain the pressurized liquid cooling system used in the cars. 10
- Q.4 a) Explain the construction working and operation of a diaphragm spring clutch. Draw the diaphragm clutch in disengaged position. 10
- b) Explain the necessity of gearbox in a vehicle with the help of resistance tractive effort curves. 10

**PART-B**

Q.5 Explain the terms with neat sketch:

- i) Camber ii) Castor
- iii) Toe in iv) Toe out

What are the effects of each on the steering characteristics of vehicle? 5x4

- Q.6 a) Describe the construction and working of drum brakes. Compare the same in details with the disc brakes. 10
- b) Write short notes on:
  - i) Antilock braking system.
  - ii) Vacuum assisted hydraulic brake. 5x2
- Q.7 a) Describe the requirements of an automobile wheel. Explain with the help of a suitable sketch the construction of disc type wheel. 10

- b) Draw a neat sketch of tyre section and then explain the importance of each part.

10

**End Semester Examination, May 2017**  
**B. Tech.–Fourth Semester**  
**FUEL AND LUBRICANTS (AU-406A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer the following:

- a) What are the various hydrocarbons present in crude oil?
- b) Define 'cracking'.
- c) Enlist desirable properties of good fuels for I.C. engine.
- d) What is alkylation?
- e) What are the various factors that affect the flame speed?
- f) What are the various stages of combustion in CI engines?
- g) What are the advantages of using natural gas as an alternative fuel?
- h) What are semisolid lubricants?
- i) What is elastohydrodynamic lubrication?
- j) Why there is a need of alternative fuel?

2 × 10

**PART-A**

- Q.2 a) What are the products of petroleum refining process? 10
- b) Explain the chemical structure of petroleum. Give the general formula of the following:
- i) Fuels
  - ii) Paraffin
  - iii) Olefin
  - iv) Naphthene
  - v) Aromatic

2 × 5

- Q.3 a) Define and discuss viscosity and viscosity index in detail. 10
- b) Draw a neat labeled sketch of Bomb Calorimeter and explain its working. 10
- Q.4 a) What is abnormal combustion? Explain the phenomena of knock in SI engine. 10
- b) Define and discuss ignition lag in detail. 10

**PART-B**

- Q.5 a) Compare properties of CNG, LPG and Biogas for its use in automobiles. 10
- b) Define and discuss spark assisted diesel engines in detail. 10
- Q.6 a) Discuss functions of lubricants in detail. 15
- b) What is grease? How does it differ from lubricating oil? 5
- Q.7 Write short notes on:
- a) Boundary lubrication.
  - b) Extreme pressure lubrication.

10 × 2

**End Semester Examination, May 2017**  
**B. Tech.–Fifth Semester**  
**AUTO ELECTRICALS AND ELECTRONICS(AU-503)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer in brief:

- a) What do you mean by negative and positive earthing?
- b) Draw a circuit diagram of starting system.
- c) Define 'battery efficiency'.
- d) Discuss the function of alternator.
- e) Compare constant voltage and constant current regulators.
- f) What is the function of ECU in modern vehicle?
- g) Explain cam angle.
- h) Explain hot spark plug and cold spark plug.
- i) Define 'bulb wattages and fog lamps'.
- j) Define 'anti-dazzling devices'.

2 × 10

**PART-A**

- Q.2 a) Give a layout of the lighting and accessory systems of an automobile. 10  
 b) How do we classify the automotive electrical system? Explain each of them briefly. 10
- Q.3 a) Describe the construction and working of the battery hydrometer. 10  
 b) Compare lead acid batteries with alkaline batteries. 10
- Q.4 a) Explain Delco Remy current and voltage regulators with a neat sketch. 10  
 b) What are defects occur in alternator? Write causes for such defects with suitable remedies. 10

**PART-B**

- Q.5 a) What do you understand by the term "interference"? Enlist the various ways by which interference can be suppressed. 10  
 b) Enlist different types of sensors fitted in a modern vehicle. Discuss throttle position sensor in detail. 10
- Q.6 a) Discuss the various troubles of the ignition system which are likely to be encountered while running the vehicle and their remedies. 10  
 b) What are the requirement of a good spark plug? Explain with the help of a neat sketch the construction details of spark plug. 10
- Q.7 a) Describe with the help of a neat diagram:  
 i) Brake warning light.  
 ii) Ignition warning light.  
 iii) Traffic indicators. 10  
 b) Discuss the various defects and their remedies which are likely to occur in the lighting system of an automobile. 10

**End Semester Examination, May 2017**  
**B. Tech.–Fifth Semester**  
**AUTOMOTIVE COMPONENTS DESIGN(AU-506)**

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.

- Q.1 Explain briefly:
- What is endurance limit?
  - Write the expression for the effect of surface factor under bending load.
  - State the function of piston rings?
  - What are the different forces acting on connecting rod?
  - What is the significance of weight in flywheel?
  - What are the design considerations for piston?
  - Classify bearings depending upon nature of contact.
  - What is meant by yield point stress and ultimate stress?
  - Explain the following terms of the spring:
    - Free length
    - Solid Length
  - What is the difference between a ball bearing and a roller bearing? 2x10

**PART-A**

- Q.2
- Drive the relation for the effect of the following on the endurance limit
    - Effect of load factor
    - Effect of size factor 10
  - A machine component is subjected to a flexural stress which fluctuates between +300 MN/m<sup>2</sup> and -150 MN/m<sup>2</sup>. Determine the value of minimum ultimate strength according to i) Goodman criteria and ii) Soderberg criteria. 10
- Q.3
- Explain the surging phenomenon in springs. 5
  - A shaft made of mild steel is required to transmit 100 kW at 300 r.p.m. The supported length of the shaft is 3 meters. It carries two pulleys each weighing 1500 N supported at a distance of 1m from the ends respectively. Assuming the safe value of stress, determine the diameter of the shaft. 15
- Q.4
- A full journal bearing of 50 mm diameter and 100 mm long has a bearing pressure of 1.4N/mm<sup>2</sup>. The speed of the journal is 900 r.p.m. and the ratio of journal diameter to the diametral clearance is 1000. The bearing is lubricated with oil whose absolute viscosity at the operating temperature of 75°C may be taken as 0.011kg/m-s. The room temperature is 35°C. Find:
- The amount of artificial cooling required, and
  - The mass of the lubricating oil required,
- If the difference between the outlet and inlet temperature of the oil is 10°C. Take specific heat of the oil as 1850 J/kg/°C. 20

**PART-B**

- Q.5
- A pair of Spur Gears consist of a 24 teeth pinion, rotating at 100 rpm and transmitting power to a 48 teeth gear. The module is 6 mm, while the face width is 60 mm. Both gears are made of steel with an  $\sigma_u = 450 \text{ N/mm}^2$ . They are heat treated to a surface hardness of 250 BHN. Assume that velocity factor account for the dynamic load.



Calculate:

- a) Beam strength.
- b) Wear strength.
- c) The rated power that the gear can transmit if service factor and the factor safety are 1.5 and 2 respectively. 20

- Q.6 The diameter of the piston is 100mm; mass of the reciprocating parts per cylinder 2.25 kg; length of connecting rod 380mm; stroke of piston 190 mm and compression ratio 6:1, running at 1800 r.p.m. and developing a maximum pressure of  $3.15\text{N/mm}^2$ . Take a factor of safety of 6 for the design. Take length to diameter ratio for big end bearing as 1.3 and small end bearing as 2 and the corresponding bearing pressures as  $10\text{N/mm}^2$  and  $15\text{N/mm}^2$ . The density of material of the rod may be taken as  $8000\text{kg/m}^3$  and the allowable stress in the bolts as  $60\text{N/mm}^2$  and in cap as  $80\text{N/mm}^2$ . The rod is to be of I-section for which you can choose your own proportions. Use Rankine formula for which the numerator constant be taken as  $320\text{N/mm}^2$  and the denominator constant  $1/7500$ . Design the I-section shank, big end bearing, piston pin and small end bearing of the connecting rod of an I.C. engine. 20

- Q.7 The indicated mean effective pressure is  $0.35\text{ N/mm}^2$ ; mechanical efficiency is 80%, brake power is 5KW, speed is 1200rpm of a four-stroke diesel engine  
Determine
- i) Bore and length of the cylinder
  - ii) Thickness of the cylinder head
  - iii) Size of studs for the cylinder head 20

**End Semester Examination, May 2017**  
**B. Tech.–Seventh Semester**  
**VEHICLE MAINTENANCE(AU-603)**

Time: 3 hrs

Max Marks:100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) What is maintenance? Define and explain.
  - b) What is extended warranty? When it is provided?
  - c) List down various types of spanners.
  - d) What is the function of a wheel balancer?
  - e) What is cylinder honing?
  - f) Enlist various components of a petrol injection system.
  - g) Why clutch free play is necessary?
  - h) What is the function of a differential?
  - i) What is bleeding of brake?
  - j) Define the term:oversteer and understeer. 2x10

**PART-A**

- Q.2
- a) Name the different types of service stations. Explain each of them in detail. 10
  - b) Draw the layout of workshop and explain its elements in detail. 10
- Q.3
- a) What is spark plug tester? Explain the procedure of spark plug testing and cleaning. 10
  - b) What do you mean by the term "jack"? Explain the various types of jacks used in automobile industry. 10
- Q.4
- a) Explain engine disassembly procedure in detail. 10
  - b) Name the different engine testing methods. Explain compression test in detail. 10

**PART-B**

- Q.5
- a) List down various symptoms and possible faults in a petrol injection system. 10
  - b) What are the different colors of smoke emitted from a diesel engine? Explain each of them with a suitable reason. 10
- Q.6
- a) Explain the working principle of clutch with the help of a neat diagram. What are the different types of clutch used in automobiles? 10
  - b) Explain symptoms and possible faults in manual transmission. 10
- Q.7
- a) Explain the term:
    - i) Caster.
    - ii) Camber.
    - iii) King pin inclination.
    - iv) Toe in and toe out.
    - v) Scrub radius. 10
  - b) Explain in detail the procedure for wheel and tyre maintenance. 10

**End Semester Examination, May 2017**  
**B. Tech.–Sixth Semester**  
**AUTOMOTIVE POLLUTION AND ITS CONTROL (AU-610)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) What is pollution?
  - b) Define 'evaporative evasion'.
  - c) How Knock emissions are caused?
  - d) What is engine knocking?
  - e) Enlist disadvantages of H.C.
  - f) How components of H.C. react with nitric acid to perform NO<sub>x</sub>?
  - g) What do you understand by C.I. engine emission?
  - h) Define 'EGR'.
  - i) What is the function of Catalytic converter?
  - j) What is the purpose of Chassis Dynamometer?
- 2 × 10

**PART-A**

- Q.2 Sketch exhaust emission v/s A/F ratio in the case of petrol engine curve and show how H<sub>c</sub>, CO and NO<sub>x</sub> produced/emitted? Explain in detail. 20
- Q.3 Explain with a neat sketch how formulation of HC and CO takes place in case of:
- a) Four Stroke Engine.
  - b) Two Stroke Engine.
- 10 × 2
- Q.4 Explain disadvantages of emission of poly nuclear HC and how their compound reacts with nitric acid and sulphuric acid to form NO<sub>x</sub> or Sox which further produce gases responsible for photochemical smoke formation which is responsible for acid rain and damage ozone layer. 20

**PART-B**

- Q.5 What are the latest Euro and Bharat norms for pollution in India, set by Transport Ministry? Also, show prescribed limits of pollutants as per norms. 20
- Q.6 What causes NO<sub>x</sub> formation in Petrol engine? Explain the effect A/F ratio and Spark advance on the emission of NO<sub>x</sub>. 20
- Q.7 Explain the following in brief with neat sketch:
- a) NDIR to measure carbon monoxide.
  - b) Gas chromatograph.
- 10 × 2

**End Semester Examination, May 2017**  
**B. Tech.–Sixth Semester**  
**MOTOR VEHICLE AND ENVIRONMENT PROTECTION(AU-617)**

Time: 3 hrs.

Max Marks:100

No. of pages:1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) What are particulate matters?
  - b) What is the importance of making Motor Vehicle Act?
  - c) What are the age limits for driving license?
  - d) What do you understand by endorsement on driving license?
  - e) What are the norms for proper registration number plate's display?
  - f) What is the need of motor vehicle insurance?
  - g) What are the restrictions on location of industries?
  - h) What do you mean by 'standards for emissions'?
  - i) What is the role of speed governors in automobiles?
  - j) What are the permissible limits of noise from automobiles?
- 2 × 10

**PART-A**

- Q.2 What are the necessities of making acts and rules on a:
- a) Motor vehicles.
  - b) Environment.
  - c) Water pollution.
  - d) Air pollution.
- 5 × 4
- Q.3 What are the necessities for licensing of conductors of stage carriages? Under which conditions a license can be granted, disqualified and revoked as per MV Act? 20
- Q.4 Explain the following terms associated with Registration of Vehicles as per MV Act:
- a) Suspension.
  - b) Cancellation.
  - c) Revocation.
  - d) Renewal.
- 5 × 4

**PART-B**

- Q.5 What is a Permit? What is the procedure for grant of a permit? Explain different types of permits in detail. 20
- Q.6 Explain the general powers of Central Govt. to protect/improve environment and rules to regulate environmental pollution in detail. 20
- Q.7 What are the guidelines given in MV Act and Central Motor Vehicle Rules regarding?
- a) Transportation of hazardous chemicals.
  - b) Operation of travel taxis.
- 10 × 2

**End Semester Examination, May 2017**  
**B. Tech.–Sixth / Seventh Semester**  
**MEASURING TECHNIQUES(AU-626)**

Time: 3 hrs

Max Marks:100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Explain following terms in brief:

- a) Active and passive transducers.
- b) Absolute temperature scales.
- c) Range and span of an instrument.
- d) Gauge pressure and vacuum.
- e) Camber and castor.

4x5

**PART-A**

Q.2 A bulb thermometer hangs outside a window and is used to measure the outside temperature. Comment on some extraneous variables that might affect the difference between the actual outside temperature and the indicated temperature from the thermometer. 20

Q.3 Write an overview of indicative transducers explaining their principle of operation like variation of number of turns, geometric configuration and permeability. Draw the neat sketch to show the above effects. 20

Q.4 Explain the construction and working of following:

- a) Rope brake dynamometers.
- b) Prony brake dynamometers.
- c) Eddy current brake dynamometers.
- d) Load cell.

5

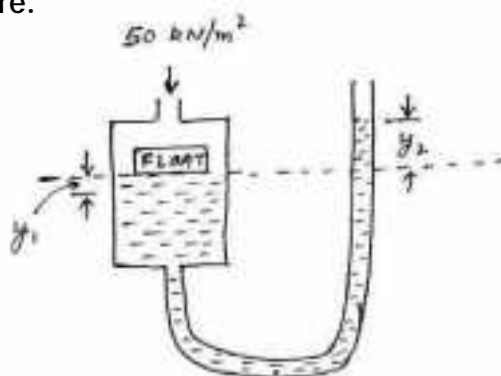
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**PART-B**

Q.5 A mercury manometer as shown in fig is to have a float in the left hand chamber. An electro – mechanical transducer is used to measure the motion of the fluid. The float motion is 5 mm for a gauge pressure of  $50 \text{ kN/m}^2$ . If the diameter of the float chamber is 40mm, find the required diameter for the right hand chamber. For Hg  $\Rightarrow$  density  $= 13600 \text{ kg/m}^3$ . Assume that the other end of the manometer is open to the atmosphere.



20

- Q.6
- a) Enlist the materials commonly used for RTDs. Which one has the most linear characteristics? 10
  - b) Explain the principle and working of optical pyrometer. 10

- Q.7** Discuss the importance of tools and equipments used in workshop. Enlist various types of hand tools. **20**

**End Semester Examination, May 2017**  
**B. Tech.–Seventh Semester**  
**COMPUTER AIDED VEHICLE DESIGN(AU-802)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) Write design variables affecting performance of CI engines.
  - b) Write operating variables affecting emission of CI engines.
  - c) Give two examples for each: saloon and convertible cars.
  - d) Differentiate between sedan and hard top.
  - e) Write two practical objectives of vehicle aerodynamics.
  - f) What is the significance of flow visualization techniques?
  - g) Define 'mean effective pressure'.
  - h) What are the different driving forces against vehicle motion?
  - i) What are the properties required for material of automobile bodies?
  - j) What are the different coats of paint needed to paint an automobile body? 2x10

**PART-A**

- Q.2 Explain how liquid cooling system for IC Engine works? For a single cylinder engine what changes in performance will be observed if we use liquid cooling system instead of air cooling system? 20
- Q.3
- a) Describe in detail the usage of safety equipment in cars. 10
  - b) Explain how visibility of a vehicle can be enhanced? 10
- Q.4
- a) Explain the effect and control of lift and drag on vehicle body design. 10
  - b) Explain how wind tunnel testing is important in vehicle design. 10

**PART-B**

- Q.5
- a) Plot and explain the typical performance curves for a petrol engine. 10
  - b) Draw the performance curve for driving force against vehicle speed. How gear ratios can be obtained from them? 10
- Q.6
- a) Define and explain the following terms:
    - i) Mean effective pressure.
    - ii) Side thrust on cylinder walls. 10
  - b) Explain the steps to be followed for a new engine design. 10
- Q.7
- a) List out the major factors to be considered for selection of material for a vehicle body fabrication. 10
  - b) List out the different types of vehicle body corruptions and explain the step by step procedure of a vehicle body painting process. 10

**End Semester Examination, May 2017**  
**B. Tech.–Sixth Semester**  
**EMERGING AUTOMOTIVE TECHNOLOGIES(AU-817)**

Time: 3 hrs.

Max Marks:100

No. of pages:1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) List features to be considered for new cars in mega cities.
  - b) How EGR affects the emission of a diesel engine?
  - c) What are reformers?
  - d) Define the term: Homogenous charge compression ignition.
  - e) List the benefits of brake by wire technology.
  - f) How are ultra-capacitors beneficial for electric automobiles?
  - g) What is fuel cell?
  - h) What are the advantages of X- by wire technology's over conventional system?
  - i) List various types of actuators used in automobile.
  - j) What is regenerative braking system? 2 × 10

**PART-A**

- Q.2
- a) Discuss the alternative mobility sources developed to use for future cars. 10
  - b) Explain the terms:
    - i) Product development management.
    - ii) Quality management. 5x2
- Q.3
- a) Explain the working of a fuel cell. 5
  - b) What are the advantages of fuel cell-powered vehicles have over battery electric vehicles? 5
  - c) Describe the onboard storage of Hydrogen fuel in a vehicle. 10
- Q.4
- a) What is throttling wire technology and what are its advantages? 10
  - b) What are the various components used to enhance the performance of diesel engine? 10

**PART-B**

- Q.5
- a) What is the difference between hybrid electric vehicles and battery electric vehicles? Explain with constructional and functional details. 10
  - b) Explain the working with layout diagrams of series-parallel and parallel hybrid electric vehicles. 10
- Q.6
- a) Explain the working along with the chemical reactions of lead acid, Alkaline and lithium ion batteries. 15
  - b) What is meant by deep discharging and rapid charging of ultra-capacitors? 5
- Q.7
- a) Explain semi-active and fully active suspension system in detail. 10
  - b) Describe constant variable transmission. How it is useful for present vehicles? 10



**End Semester Examination, May 2017**  
**B. Tech.–First/ Second Semester**  
**ELEMENTS OF BIOTECHNOLOGY(BT-101A)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Briefly answer:

- a) State the law of independent assortment.
- b) What do you mean by homologous chromosome?
- c) Enumerate the major functions of cell membrane in eukaryotic cell.
- d) What is Allopatric Speciation?
- e) Define Darwin's theory of natural selection.
- f) What are the uses of embryonic stem cells?
- g) What is site-directed mutagenesis?
- h) What is cholesterol and which disorder it can produce?
- i) What is Chargaff's rule?
- j) What is the significance of gene cloning?

2x10

**PART-A**

- |     |  |    |
|-----|--|----|
| Q.2 | a) Describe the electron microscopic structure of cell and state its function. | 10 |
|     | b) Enumerate the functions of Mitochondria.                                    | 10 |
| Q.3 | a) What is gametic isolation?  | 5  |
|     | b) What do you mean by microevolution and macroevolution?                      | 15 |
| Q.4 | a) What are the autosomal diseases, describe any two.                          | 10 |
|     | b) Write notes on chromosome.  | 10 |

**PART-B**

- |     |   |    |
|-----|---|----|
| Q.5 | a) Explain the double helix structure of DNA.                       | 10 |
|     | b) Discuss essential features of DNA replication.                   | 10 |
| Q.6 | a) Discuss the advantages and disadvantages of transgenic microbes. | 10 |
|     | b) Comment on ethical concerns related to transgenic animals        | 10 |
| Q.7 | a) Enlist the entrepreneurship potentials of biotechnology.         | 10 |
|     | b) Give salient features of "Cartagena Protocol on Biosafety".      | 10 |

# End Semester Examination, May 2017

## B. Tech.–Second Semester BIOMOLECULES (BT-201)

Time: 3 hrs.

Max Marks:100

No. of pages:2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1 Write down the name and structure of:
- Building block of hereditary molecule.
  - Compound containing polar covalent bonds.
  - Amino acid which is optically non active.
  - Basic heterocyclic amino acids.
  - Substrate on which Alanine transaminase acts.
  - Coenzyme derived from Niacin.
  - Six carbon containing polyhydroxy aldehydes.
  - Trioses not existing in stereo-isomeric forms.
  - Mixed triacylglycerols.
  - Purine derivative.

2 × 10

### PART-A

- Q.2
- Who showed the relationship between pH, pKa and buffer concentration. Derive that equation. 10
  - What do you understand by neutralization reactions? With the help of an example show conjugated acid and base pairs. 5
  - How is biochemistry different from chemistry? Why was there a need to study this discipline? 5
- Q.3
- Write in detail (with structures) about the classification of amino acids according to net charge on amino acids. 15
  - Write about the various techniques employed for concentration and primary purification of proteins from crude extract. 5
- Q.4
- Enzymes are known to increase the rate of reaction by decreasing the activation energy. What are various mode of catalysis employed by enzymes? Write in details about the catalysis action of serine proteases. 12
  - As the number of enzymes being discovered are increasing, it is very difficult to name them (common names). To overcome this, enzymes were divided into different classes on the basis of reaction they perform. With the help of examples briefly explain them. 8

### PART-B

- Q.5 With the help of examples (wherever required) and structures, differentiate between:
- Epimers and Diastereomers.
  - Reducing sugar and Non-reducing sugar.
  - Maltose and Cellobiose.
  - Starch and glycogen.
  - Homo- polysaccharides and hetero-polysaccharides.

4 × 5

- Q.6 a) Write in detail about the classification of lipids on the basis of constituting groups. 15  
b) What do you understand by "PUFA"? With the help of example differentiate between MUFA and PUFA. 5
- Q.7 a) On the basis of function they perform, RNA has been classified on different types. Write in detail about types of RNA. 12  
b) Compare the essential and contrasting features of B-DNA and A-DNA. 8

**End Semester Examination, May 2017**  
**B. Tech.–Second Semester**  
**GENETICS AND CYTOGENETICS (BT-202)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer Briefly:

- a) Differentiate between 'genetics' and 'cytogenetics'.
- b) What do you mean by 'penetrance of a gene'?
- c) What are the repeating units of nucleic acids?
- d) Define 'nucleosomes'?
- e) What are lethal alleles?
- f) What are accessory chromosomes?
- g) Write down two examples of chemical mutagens.
- h) Write down note on Iso-chromosomes.
- i) Define 'maternal effect'.
- j) Explain genetic drift.

2 × 10

**PART-A**

Q.2 Write down note on the following:

- a) Mendal's law of independent assortment with an example.
- b) Dominant epistasis with an example.

10

10

- Q.3
- a) Define 'euploidy'. Discuss origin and types of polyploidy.
  - b) Explain chromosomal theory of inheritance.

10

10

Q.4 Explain the following:

- a) Polytene chromosomes with diagram.
- b) Repetitive and non-repetitive DNA.

12

8

**PART-B**

- Q.5
- a) Define 'genetic mapping'. Explain gene mapping by two point test cross.
  - b) Illustrate different mechanism of DNA repair.

10

10

- Q.6
- a) Explain extranuclear inheritance with an example.
  - b) Write down note on cytoplasmic male sterility.

15

5

- Q.7
- a) Discuss the method for determining gene frequency.
  - b) Explain quantitative inheritance by giving some example.

10

10

# End Semester Examination, May 2017

## B. Tech.–ThirdSemester CELL BIOLOGY(BT-301A)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Briefly answer:

- a) How is a plant cell different from an animal cell?
- b) Differentiate between 'peroxisomes' and 'glyoxysomes'?
- c) What do you mean by extranuclear DNA?
- d) Differentiate between tumor suppressor genes and oncogenes.
- e) What do you mean by aponeurosis?

4x5

### PART-A

Q.2 a) Describe the structure of 'plasma membrane' with reference to fluid mosaic model.

10

b) Enlist the functions of membrane proteins in detail.

10

Q.3 a) Discuss the structure and functions of the cytoskeleton in detail.

10

b) Name the organelle known as "suicidal bags". How are they synthesized in the cell?

10

Q.4 Give structure and functions of:

a) Ribosomes.

10

b) Mitochondria.

10

### PART-B

Q.5 What is cell signaling? Describe the different pathways of intracellular cell signal transduction with the help of flow charts and diagrams.

20

Q.6 a) Discuss the role of ECM in animal cells in detail.

10

b) What types of genes get mutated in cancer? Explain.

10

Q.7 Discuss the structure, properties types and functions of a muscle cell in detail.

20

**End Semester Examination, May 2017**  
**B. Tech.–Third Semester**  
**MICROBIOLOGY(BT-302A)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Briefly answer:

- a) What is the difference between fermenters and microaerophiles?
- b) What are the contributions of Louis Pasteur in the field of microbiology?
- c) How a sample containing spores is sterilized?
- d) What is the difference between flash pasteurization and batch pasteurization?
- e) What is a synchronous culture?
- f) What is the difference between selective media and differential media?
- g) Describe the state of the F factor in an Hfr, F<sup>+</sup>, and F' strain.
- h) Differentiate between 'obligate anaerobes' and 'facultative anaerobes'.
- i) What do you understand by the term: 'antisepsis and sterilization'?
- j) How heat sensitive solutions are sterilized?

2x10

**PART-A**

- Q.2 a) Enumerate the various molecular approaches for the classification of bacteria. 12  
 b) What is Bergeys Manual? Describe the characteristics of the four classes into which bacteria has been placed. 8
- Q.3 a) How is Gram negative bacteria different from Gram positive bacteria? Why absolute alcohol does not readily decolorize Gram positive bacteria? 14  
 b) Explain the lytic life cycle of a virus. 6
- Q.4 a) What is a pure culture? Describe the different techniques used to obtain a pure culture. 14  
 b) A bacterium increases its number from 10<sup>3</sup> cells/ml to 10<sup>8</sup> cells/ml in 10 hours. Calculate the mean generation time. 6

**PART-B**

- Q.5 a) In *E. coli*, four Hfr strains donate the following genetic markers shown in the order:  
 Strain 1: Q W D M T  
 Strain 2: A X P T M  
 Strain 3: B N C A X  
 Strain 4: B Q W D M  
 All of these Hfr strains are derived from the same F<sup>+</sup> strain. What is the order of these markers on the circular chromosome of the original F<sup>+</sup>? 8  
 b) What is transformation? How transforming principle was discovered? 12
- Q.6 Briefly explain *any two* of the following:  
 a) Krebs cycle.  
 b) Electron transport chain.  
 c) Photosynthesis. 10x2
- Q.7 Write short notes on following chemical agents in microbial control:  
 a) Halogens.

- b) Phenols.
- c) Heavy metals.
- d) Gases.

**5x4**

# End Semester Examination, May 2017

## B. Tech.–Third Semester BIOCHEMISTRY (BT-303C)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer briefly:

- a) Differentiate between exergonic and endergonic reactions.
- b) How urea cycle and citric acid cycle are linked?
- c) Briefly explain Cori cycle.
- d) What do you understand by salvage pathway of purine synthesis?
- e) Write a short note on 'classification of lipids'.

5x4

### PART-A

- Q.2
- a) Explain with the help of a diagram how does ATP/ADP cycle works. 10
  - b) Explain the importance of bioenergetics in metabolism with an example. 10
- Q.3 Write short notes on:
- i) Transamination. 5
  - ii) Decarboxylation. 5
  - iii) Biosynthesis of Tryptophan. 10
- Q.4
- a) Describe in detail the two phases of Pentose Phosphate Pathway. 10
  - b) How is Glyoxylate cycle different from TCA cycle? 10

### PART-B

- Q.5
- a) Explain in detail the relation between chemiosmotic theory and ATP synthesis. 10
  - b) What is the need of uncoupling ETC with ATP synthesis? Name any two uncouplers and inhibitors. 10
- Q.6
- a) Describe the various steps involved in fatty acid oxidation. 10
  - b) Explain briefly:
    - i) Dehydrogenation.
    - ii) Hydration in  $\beta$  oxidation. 10
- Q.7
- a) Explain various steps involved in the De Novo synthesis of Pyrimidine. 10
  - b) How do nitrogenous base form nucleotides and nucleosides? Give functions of nucleotides. 10



**End Semester Examination, May 2017**  
**B. Tech.–Third Semester**  
**BIOANALYTICAL TECHNIQUES (BT-305B)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

Q.1 Answer briefly

- |   |   |
|---|---|
| a) Differentiate between 'accuracy' and 'precision of an instrument'. | 3 |
| b) State Stoke's law and explain each term in the equation.           | 3 |
| c) What do you understand by empty magnification?                     | 2 |
| d) Enlist applications of centrifugation.                             | 2 |
| e) Highlight the advantages of HPLC.                                  | 2 |
| f) Explain the principle of separation used in isoelectric focussing. | 3 |
| g) Define hyperfine interactions in ESR spectroscopy.                 | 2 |
| h) Give properties of (a) alpha (b) beta and (c) gamma radiations     | 3 |

**PART-A**

- Q.2
- |   |     |
|---|-----|
| a) What are the functional parts of an instrument?  |     |
| b) What is calibration? How is calibration carried out?   |     |
| c) Explain the following parameters that determine the performance of an equipment:<br>i) Sensitivity ii) linearity iii) resolution iv) threshold |     |
| d) Describe the methods employed to reduce errors in measurement.   | 4x5 |
- Q.3
- |   |    |
|---|----|
| a) What are the advantages of fluorescence microscopy?  | 5  |
| b) Describe the construction and working of a Transmission Electron microscope. Draw a well labelled diagram. | 10 |
| c) Explain the technique of density gradient centrifugation.  | 5  |
- Q.4 Elaborate the principle, sample preparation, binding and elution in:
- |                                |    |
|--------------------------------|----|
| a) Ion Exchange Chromatography | 10 |
| b) Affinity Chromatography     | 10 |

**PART-B**

- Q.5
- |  |   |
|--|---|
| a) A DNA sample has been cut with a restriction enzyme to produce 5 pieces of DNA of the following lengths A = 12kbp, B = 30kbp, C = 95kbp, D = 50kbp, E = 70kbp. Draw a diagram below to demonstrate sequence of bands after agarose gel electrophoresis. | 6 |
| b) How is molecular weight determined by gel electrophoresis?  | 6 |
| c) What is the role of following components used for gel electrophoresis ?<br>(i) Glycerol (ii) Coomassie blue (iii) $\beta$ Mercaptoethanol (iv) TEMED  | 8 |
- Q.6 Discuss in detail the principle and instrumentation in following types of spectroscopies
- |                            |    |
|----------------------------|----|
| a) UV-Visible spectroscopy | 10 |
| b) Infra-red spectroscopy  | 10 |
- Q.7 Write detailed notes on:
- |                                  |  |
|----------------------------------|--|
| a) Applications of radioactivity |  |
| b) Townsend avalanche            |  |
| c) Scintillation counters        |  |

**d) Radiation hazards****4x5**

**End Semester Examination, May 2017**  
**B. Tech.–Third Semester**  
**BIOCHEMICAL CALCULATIONS (BT-306B)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer briefly:

- a) How is Kelvin related to degree Celsius? Convert 57°C into Kelvin units.
- b) What are isotopes and isobars?
- c) Explain coupled assays for detection of enzymes.
- d) Give four differences between DNA and RNA.
- e) What is the principle of polarimeter? Explain.

5x4

**PART-A**

- Q.2 a) What are the different types of titrations? Explain the role of an indicator in titrations. 10
- b) What should be the characteristic features of a biological buffer? Explain. 10
- Q.3 a) Write a properties of alpha, beta and gamma particles in detail. 10
- b) Calculate yield% of  $\text{CHCl}_3$  for the following reaction: 6
- $$\text{CH}_4 + 3\text{Cl}_2 \rightarrow \text{CHCl}_3 + 3\text{HCl}$$
- c) What is degree of completion? Discuss. 4
- Q.4 a) Define the following
- i) Intensive property.
  - ii) Internal energy.
  - iii) Path independence.
  - iv) Heat of solution.
  - v) Latent heat of sublimation. 10
- b) Calculate heat change for the following reaction:
- $$\text{COCl}_2 + 2\text{H}_2\text{S} \rightarrow 2\text{HCl} + \text{H}_2\text{O} + \text{CS}_2 \text{ given that:}$$
- (i)  $\text{COCl}_2 + \text{H}_2\text{S} \rightarrow 2\text{HCl} + \text{COS}$   $\Delta H^0 = -78.705\text{kJ}$
- (ii)  $\text{COS} + \text{H}_2\text{S} \rightarrow \text{H}_2\text{O} + \text{CS}_2$   $\Delta H^0 = -3.420\text{kJ}$  10

**PART-B**

- Q.5 a) What is Ramachandran plot? Explain briefly. 6
- b) Discuss the different structures of proteins. 10
- c) Calculate average half-life period of (i) U – 238 given  $t_{1/2} = 4.5 \times 10^9$  years (ii) Po – 214 given  $t_{1/2} = 1.64 \times 10^{-8}$  sec. 4
- Q.6 a) If a sample of concentration 5 g/L transmits 68% of incident light when placed in 1 cm cuvette; calculate the transmission if (i) the concentration is 10 g/L (ii) path length is doubled. 10
- b) What is SDS gel electrophoresis? Explain. 6
- c) A sample of DNA isolated from bacteria contains 21.7% adenine on a molar basis. Calculate the percentage of other bases present in the DNA. 4
- Q.7 a) Explain the Briggs and Haldane steady state approach for enzyme kinetics. 10

**b) Discuss in detail different types of enzyme inhibition.**

**10**

**End Semester Examination, May 2017**  
**B. Tech.–Third Semester**  
**BIOCHEMICAL CALCULATIONS(BT-306C)**

Time: 3 hrs

Max Marks:100

No. of pages: 2

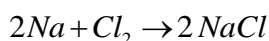
Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer briefly:

- a) An optical filter passes only far red light with an average wavelength of 6524 angstrom. Calculate the frequency, wave number in  $\text{cm}^{-1}$  and wavelength in decimeters.
- b) What is katal? How is it related to 'U'?
- c) If there is no change in work or heat then what is the value of internal energy change? Also, if heat is transferred to the system from surroundings will the value be greater or lesser than zero?
- d) What is the difference between end point and equivalence point?
- e) What is the group displacement law? 5x4

**PART-A**

- Q.2
  - a) What are the different methods to determine the endpoint of a reaction? 10
  - b) How does sodium acetate buffer function (i) if an acid is added (ii) if an alkali is added? 8
  - c) What is the % concentration of 75g ethanol dissolved in 500g of water? 2
- Q.3
  - a) What does the following values indicate for a solution if (i)  $\text{pK}_a < 2$  (ii)  $\text{pK}_a > 2$  (iii)  $\text{pK}_a > 7$  but less than 10 (iv)  $\text{pK}_a$  is between 10 and 14. 8
  - b) What are the criteria for selecting a buffer for any reaction? 6
  - c) What do you mean by acidimetry and alkalimetry? How does methyl orange and methyl violet behave with change in pH? 6
- Q.4
  - a) What are the different laws on which stoichiometry is based? Discuss in detail. 10
  - b) Write short notes on: (i) Excess reactants (ii) Limiting reactants 6
  - c) A student places a 0.8g piece of sodium inside a  $500 \text{ cm}^3$  flask containing chlorine gas. How much sodium chloride would be formed by the reaction at STP? 4



**PART-B**

- Q.5
  - a) What is a half-life period of a radioactive material? Derive the equation. 8
  - b) What are the differences between DNA and RNA? Write briefly. 6
  - c) What are proteins? How can one estimate the amount of protein present in a sample? 6
- Q.6
  - a) What is feedback inhibition of enzyme? Discuss briefly. 4
  - b) Derive Michaelis-Menten equation. 10
  - c) For a reaction  $E + S \rightleftharpoons ES \rightarrow E + P$   $k_1 = 1 \times 10^7 \text{ M}^{-1} \text{ sec}^{-1}$ ,  $K_{-1} = 1 \times 10^2 \text{ sec}^{-1}$  and  $k_p = 3 \times 10^2 \text{ sec}^{-1}$ , calculate (i)  $K_s$  (ii)  $K_m$  6

- Q.7 a) What is biuret method? Discuss briefly. 4
- b) 33.3 grams of a polysaccharide on hydrolysis gave only mannose and glucose. The hydrolysate was diluted to 100ml and its observed polarization was  $+9.07^\circ$  in a 10cm tube. Calculate the ratio of glucose and mannose present in the polysaccharide. The specific rotations of glucose and mannose are  $+52.7^\circ$  and  $+14.5^\circ$ , respectively. 10
- c) 10 grams of butter was saponified and the nonsaponifiable fraction extracted in 25ml of chloroform. The absorbance of the chloroform solution was 0.53 at 328nm and 0.48 at 458nm in a 1cm cuvette. Calculate carotene and vitamin A content of the butter whose extinction coefficients are given below:

Compound	328 nm	458 nm
Carotene	340	2200
Vitamin A	1550	-

6

**End Semester Examination, May 2017**  
**B. Tech.–Third Semester**  
**CONCEPTS IN IMMUNOLOGY(BT-307)**

Time: 3 hrs

Max Marks:100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

Q.1 Answer the following in brief:

- a) What are antigen and antibody?
- b) How monocytes are different from macrophages?
- c) What are antitoxins?
- d) Briefly explain primary and secondary immune response.
- e) Draw the labeled diagram of MHC I and MHC II.
- f) Write the principle of radial immune assay.
- g) What are adjuvants?
- h) Briefly explain the tumor biomarkers.
- i) Why an autoimmune disorder can occur?
- j) What is a whole organism vaccine?

2x10

**PART-A**

Q.2 a) Differentiate between the following:

- i) T cell and B cell
  - ii) MALT and SALT
  - iii) Primary lymphoid organs and secondary lymphoid organs.
- b) Discuss about Granulocytes and Agranulocytes.

12

8

Q.3 a) Explain the structure, function and the types of antibodies.

12

b) What is complement system? Explain the classic complement system.

8

Q.4 Write notes on the following in detail:

- a) Immunoglobulin heavy gene
- b) Major Histocompatibility Complex (MHC).
- c) Human leucocytes antigen (HLA) restriction

6

8

6

**PART-B**

Q.5 What are monoclonal antibodies? Explain the production and selection of monoclonal antibodies? Discuss the application of hybridoma technology also.

20

Q.6 Write the principle, procedure and the applications of following techniques:

- a) Ouchterlony double diffusion test
- b) Indirect ELISA.
- c) Direct immunofluorescence.

6

8

6

Q.7 a) Define Hypersensitivity? How immediate type hypersensitivity can occur?

10

b) Distinguish between the following:

- i) Active and passive immunization.
- ii) Attenuated and DNA vaccines.

10

**End Semester Examination, May 2017**  
**B. Tech.–Fourth Semester**  
**MOLECULAR BIOLOGY (BT-401A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Do as directed:

- a) The strand which is transcribed during transcription is \_\_\_\_\_.
- b) Transcription starts at \_\_\_\_\_
- c) The initiation codon is \_\_\_\_\_
- d) Jumping genes, also called as the transposable elements were discovered by \_\_\_\_\_
- e) *Drosophila* contains two major families of transposons namely, \_\_\_\_\_ and \_\_\_\_\_.
- f) The largest proportion of the human genome is contained in which of the following transposable element \_\_\_\_\_.
- g) What is the meaning of the term consensus sequence? Give an example.
- h) What sequence elements are found within the core promoter of structural genes in eukaryotes? Describe their locations and specific functions.
- i) How does the 30S subunit know where to bind on the mRNA molecule?
- j) Explain how acetylation of core histones may loosen chromatin packing?
- k) Explain how phosphorylation of CREB protein?
- l) What is a CpG island? How does methylation of CpG island affect gene expression?
- m) How does a eukaryotic ribosome select its start codon?

1 × 6

2 × 7

**PART-A**

- Q.2 a) Describe the mechanisms by which eukaryotic DNA become compacted. 15
- b) What are cot curves? How do the cot curves depict the evolutionary complexity in prokaryotes? 5
- Q.3 a) Summarize the roles of different types of polymerases present for the replication of genomic DNA in eukaryotes. 8
- b) How damaged DNA can be repaired in a cell? 12
- Q.4 a) How poly A tail is added at the 3' end of pre mRNA? 12
- b) Discuss the promoters and transcription factors recognized by RNA polymerase III. 8

**PART-B**

- Q.5 a) Describe the function of Ara C protein. How does it positively and negatively regulate the Ara operon? 15
- b) What is diauxic growth? Explain the role of cAMP in this process? 5
- Q.6 a) Briefly explain the post translational modifications that alter the location of a protein. 10
- b) How the proteins get glycosylated? What are its advantages? 10
- Q.7 Write short notes on *any two* of the following:
  - a) Types of transposable elements in prokaryotes.
  - b)  $A_c$ - $D_s$  controlling elements in maize.



- c) P-elements in *Drosophila*.
- d) Transposable elements in humans.

**10×2**

**End Semester Examination, May 2017**  
**B. Tech.–FourthSemester**  
**IMMUNOLOGY (BT-402A)**

Time: 3 hrs.

Max Marks:100

No. of pages:1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer briefly:

- a) How is IgA secreted across mucosal surfaces?
- b) How can the immune system distinguish between tumor cells and normal cells?
- c) What are epitopes?
- d) What molecules are presented on MHC I and MHC II respectively?
- e) What are anaphylatoxins?
- f) How ODD differs from radial immunodiffusion?
- g) What are redundant cytokines?
- h) What are tumor associated transplantation antigens?
- i) What are haptens?
- j) Give an example of immediate type of hypersensitivity.

2 × 10

**PART-A**

Q.2 What are primary and secondary lymphoid organs? Discuss the structure and functions of each. 20

- Q.3
- a) Contrast between the isotypic, allotypic and idiotypic determinants on an antibody molecule. 8
  - b) What are complement proteins? How do they get activated to form membrane attack complex by alternate pathway? 12

- Q.4
- a) Explain how light chain DNA undergoes gene rearrangement? 8
  - b) How exogenous antigens are processed and presented on the surface of antigen presenting cells? 12

**PART-B**

- Q.5
- a) Comment on the relative importance of the humoral and cell mediated responses in protective immunity to viruses. 8
  - b) What immune responses are generated against the extracellular bacteria? 12

- Q.6
- a) What is ELISA? Discuss the different variants of ELISA? 14
  - b) What is the principle behind Ouchterlony double diffusion? 6

Q.7 What do you understand by the term: Hypersensitivity? Explain the delayed type of hypersensitivity reactions alongwith the clinical manifestations of the same. 20

**End Semester Examination, May 2017**  
**B. Tech.(Biotechnology) – Fourth Semester**  
**INDUSTRIAL MICROBIOLOGY (BT-403A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 a) *Answer the following questions as directed:*

- i) The true goal of fermentation is to produce two ATP. If false then justify your answer.
- ii) Dr. Benjamin Minge Duggar and Alexander Fleming discovered penicillin and tetracycline? If false then give the correct answer.
- iii) What do you understand by the term: aseptic conditions?
- iv) How can one screen the presence of industrially important microorganisms?
- v) Name two microbial strains used for the production of ethanol and acetic acid.
- vi) How proteases are useful in detergent industry?
- vii) Why penicillin is added in the formation process of glutamic acid?
- viii) Name the microbial strains used for the production of streptomycin and tetracycline? 2 × 8

b) *Fill in blanks:*

- i) Riboflavin is required for the proper development and function of the \_\_\_\_\_ lining of the \_\_\_\_\_, \_\_\_\_\_ and many other parts of the \_\_\_\_\_.
- ii) The production decision for industrially important products based on the \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_. 2 × 2

**PART-A**

- Q.2 a) Discuss about the different components of a fermentation processes? 10  
 b) Differentiate between 'batch' and 'continuous fermentation'. 10
- Q.3 a) Describe the methods used for the improvement of industrially important fungi by recombinant DNA approach. 10  
 b) How the microbial strains could be preserved? 10
- Q.4 a) What are the microbial strains used for the production of butanol? Explain the biosynthesis of ethanol. 10  
 b) Discuss the methods used for the industrial production of amylase. 10

**PART-B**

- Q.5 a) Give a detailed account of penicillin mode of action and industrial production. 10  
 b) Briefly explain the occurrence and economic significance of riboflavin. 10
- Q.6 a) Write short notes on:  
 i) Biopolymers.  
 ii) Rhizobium as bio fertilizer. 5 × 2  
 b) What is single cell protein? Discuss its advantages and disadvantages in detail. 10
- Q.7 a) Discuss the relationship of media design and fermentation economics. 10  
 b) Describe the critical parameters for product decision for a fermentation process. 10

**End Semester Examination, May 2017**  
**B. Tech. (Biotechnology)- Fourth Semester**  
**BASICS OF CHEMICAL ENGINEERING (BT-404A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Answer briefly the following questions:

- |  |   |
|--|---|
| a) Why does reaction rate increase with increase in temperature?   | 2 |
| b) What is the kinematic viscosity of a liquid that has a density of $1.2 \text{ g cm}^{-3}$ and adynamic viscosity of 2 cP? | 3 |
| c) Differentiate between laminar and turbulent flow.   | 3 |
| d) Write a general expression for Fick's first law and define all terms in the equation, and their dimensions.               | 3 |
| e) What is an azeotrope?   | 3 |
| f) What are the different types of experimental errors?  | 3 |
| g) What are the limitations of feedback controller?  | 3 |

**PART-A**

- Q.2 a) For the oxidation of ammonia  $4\text{NH}_3 + 3\text{O}_2 \rightarrow 2\text{N}_2 + 6\text{H}_2\text{O}$  it was found that the rate of formation of  $\text{N}_2$  was  $0.54 \text{ mol L}^{-1} \text{ s}^{-1}$ .
- |   |       |
|---|-------|
| i) At what rate was water being formed?                                 |       |
| ii) At what rate was ammonia being consumed?                            | 3 × 2 |
| b) Discuss the factors that affect the rate of heterogeneous reactions. | 6     |
| c) What are the non-idealities existing in reactors?                    | 8     |
- Q.3 a) State Newton's law of viscosity. Explain the rheogram of a Newtonian fluid. 6
- b) Explain in detail the Hagen-Poiseuille equation for flow of fluids in circular pipes. 6
- c) Describe a method to determine viscosity of a Newtonian fluid. 8
- Q.4 a) Compare heat transfer by:
- |   |    |
|---|----|
| i) Conduction.  |    |
| ii) Convection.   |    |
| iii) Radiation.   |    |
| Also give equations that describe the transfer of heat by these methods.              | 10 |
| b) Describe in detail the construction and working of any one type of heat exchanger. | 10 |

**PART-B**

- Q.5 a) Describe in detail film theory of mass transfer. 8
- b) Discuss some parameters that could be manipulated to increase the rate of convective mass transfer. 8
- c) How does increase in temperature affect mass transfer by diffusion? 4
- Q.6 Write in detail about the following unit operations:
- |                     |        |
|---------------------|--------|
| a) Adsorption.      |        |
| b) Crystallization. | 10 × 2 |
- Q.7 a) Explain the principle of feed-forward controller. Draw a well-illustrated diagram showing its components. 10
- b) Differentiate between accuracy and sensitivity. 5
- c) What are resistance temperature detectors? 5

**End Semester Examination, May 2017**  
**B. Tech.(Biotechnology) — Fourth Semester**  
**THERMODYNAMICS OF BIOPROCESS (BT-405A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Answer briefly:

- a) Define thermodynamics. State two laws of thermodynamics.
- b) Define Gibbs free energy. How is it different from standard free energy?
- c) Differentiate between equilibrium and non-equilibrium systems.
- d) Explain about Prigogine's principle.
- e) Explain the zeroth law of thermodynamics with an example. 4 × 5

**PART-A**

- Q.2
  - a) Discuss the relevance second law of thermodynamics in biological system.
  - b) Discuss the stages of Carnot cycle with a well labeled diagram. 10 × 2

Q.3 Explain the following:

- a) Phase transition. 6
- b) Irreversible reaction. 6
- c) Henrys law. 8

- Q.4
  - a) Explain the types of systems in thermodynamics with examples. Also, explain their characteristics in brief.
  - b) Describe the concept of flux and force with examples. 10 × 2

**PART-B**

- Q.5
  - a) Discuss about the concepts of entropy production in detail.
  - b) Describe Onsager reciprocal relation in biological processes in detail. 10 × 2

- Q.6
  - a) What is diffusion? Derive the expression of Boltzmann energy equation.
  - b) Describe the partition function in detail. 10 × 2

Q.7 Write short notes on:

- a) Glycolytic oscillatory behavior in yeast cells.
- b) Thermo analysis of oxidative phosphorylation. 10 × 2

**End Semester Examination, May 2017**  
**B. Tech.— Fourth Semester**  
**BIOINFORMATICS AND COMPUTER APPLICATIONS (BT-406)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Answer the following question in brief:

- a) Name two genomic databanks.
- b) What do you mean by LAN?
- c) What type of information one can extract from primary database?
- d) How pair wise sequence alignment is related to homology studies?
- e) Enlist two features of Needleman and Wunch algorithm.
- f) What is the role of DDBJ?
- g) Expand the PIR format.
- h) Enumerate the advantages of X-ray crystallography?

2½ × 8

**PART-A**

- Q.2 a) How internet, intranet and extranet are different from each other?  
 b) Discuss networking protocol. How OSI model is different from TCP/IP? 10 × 2
- Q.3 a) How cDNA is different from genomic DNA? 6  
 b) Discuss any DNA sequencing method? 14
- Q.4 a) Explain PDB and EMBL databanks in detail.  
 b) 'Databases are the heart of bioinformatics'. Justify. 10 × 2

**PART-B**

- Q.5 Align the given sequence using Smith-Waterman programming algorithm for the given sequences ATCGTT and AGCGAT up to trace back using +2, -1 and 0 for match, mismatch and gap penalty respectively. 20
- Q.6 a) How multiple sequence alignment is helpful in evolutionary studies? Justify using an example. 8  
 b) What are the different methods used for multiple sequence alignment? 12
- Q.7 Write short notes on:  
 a) Protein classification.  
 b) Protein structure determination method. 10 × 2

**End Semester Examination, May 2017**  
**B. Tech.–Fifth Semester**  
**RECOMBINANT DNA TECHNOLOGY (BT-501A)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

**Q.1 Answer briefly:**

- a) How does antibiotic resistance genes act as selectable markers?
- b) What feature is seen in the sequences recognized by type I & type III restriction enzymes?
- c) What is SI nuclease? How does this enzyme participate in recombinant DNA technology?
- d) How can a eukaryotic protein be produced in a prokaryotic host?
- e) How screening of a phage replacement vector is done?
- f) How RAPD is different from RFLP?
- g) What are the different elements of an expression vector?
- h) Name any two transgenic plants.

2½x8

**PART-A**

**Q.2** How do the following enzymes contribute to the recombinant DNA technology? State the application of each.

- a) Terminal deoxynucleotidyl transferase.
- b) T4 polynucleotide kinase and alkaline phosphatase.
- c) P<sub>ow</sub> polymerase.
- d) Klenow polymerase.
- e) Reverse transcriptase.

4x5

**Q.3** a) A bacteriophage can grow both lytically and lysogenically. What genetic determinants dictate the development of these life cycles? 15

b) How biological containment of a recombinant phage vector is ensured? 5

**Q.4** a) How subtraction cDNA libraries are prepared? What is the significance of such libraries? 12

b) How Sangers Di deoxychain termination method can be automated? 8

**PART-B**

**Q.5** Discuss various methods for the introduction of foreign DNA into a host cell. 20

**Q.6** a) Discuss the various inducible promoter systems used for the production of heterologous proteins in *Saccharomyces cerevisiae*. 14

b) List down the drawbacks of *E.coli* for the production of foreign proteins. 6

**Q.7** Write short notes on the following:

- a) Inverse PCR. 8
- b) Overlap extension PCR. 7
- c) Northern blotting. 5

# End Semester Examination, May 2017

B. Tech.–Fifth Semester

## BIOREACTOR AND BIOPROCESS ENGINEERING (BT-502 / BT-502A)

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- |     |    |  |   |
|-----|----|--|---|
| Q.1 | a) | What is the role of the biochemical engineer in biotechnology?   | 3 |
|     | b) | How the chemical processes are different from the biochemical processes?                                     | 3 |
|     | c) | Mention the names and explain in brief about the factors that affect the growth of microbes in a bioreactor. | 3 |
|     | d) | What is fed -batch culture process?  | 3 |
|     | e) | What is an ideal reactor?  | 3 |
|     | f) | What is a batch sterilization?   | 3 |
|     | g) | What is GMP?   | 2 |

### PART-A

- |     |                                     |  |     |
|-----|-------------------------------------|--|-----|
| Q.2 | a)                                  | Write a note on the microbial and biochemical interaction with chemical engineering. | 10  |
|     | b)                                  | Explain and compare the batch and continuous fermentation processes.                 | 10  |
| Q.3 | a)                                  | Briefly describe the Monod model for microbial growth.                               | 10  |
|     | b)                                  | Write a note on mass balance in fermentation processes.                              | 10  |
| Q.4 | Write short notes on the following: |  |     |
|     | a)                                  | Fluidized bed bioreactor.  |     |
|     | b)                                  | Bubble column bioreactors.   |     |
|     | c)                                  | Packed bed reactor.  |     |
|     | d)                                  | Air derived bioreactor.  | 5x4 |

### PART-B

- |     |                        |   |    |
|-----|------------------------|---|----|
| Q.5 | a)                     | Write a note on continuous sterilization process.   | 10 |
|     | b)                     | What is meant by Del factor? Describe the calculation of the Del factor for a fermentation process. | 10 |
| Q.6 | Explain the following: |   |    |
|     | a)                     | Factors affecting $K_L a$ .   | 10 |
|     | b)                     | Liquid -Solid mass transfer.  | 10 |
| Q.7 | a)                     | Which factors affect the cellular oxygen demand in fermentation?                                    | 5  |
|     | b)                     | Discuss the principle of scale up of bioprocess.  | 10 |
|     | c)                     | Why GMP is an essential part of a fermentation process?   | 5  |



**End Semester Examination, May 2017**  
**B. Tech.–Fifth Semester**  
**ENZYME BIOTECHNOLOGY (BT-503 / BT-503A)**

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

Q.1 Answer in brief:

- a) Differentiate between 'matrix entrapment' and 'microencapsulation'.
- b) Why are the microbes being preferred to plant and animals as a source of enzyme?
- c) What do you mean by salting out and how is it useful in concentrating proteins from cell extracts.
- d) Why was the need of enzymes occurred in detergent industry?
- e) Name any two enzymes which have been obtained from plant and are used in commercial purpose.
- f) What does sizing and desizing mean in textile industry? Name the enzyme used.
- g) How can immobilized enzymes be used in bioremediation?
- h) Name the enzyme used for clarification of packed juices. Also, name the organism from which it is obtained.
- i) How can enzymes be helpful in production of animal feed?
- j) Write down the basic criteria for successful enzyme immobilization.

2x10

**PART-A**

- Q.2 a) Common or trivial name of enzymes does not tell about the reaction being performed by the enzyme. Enzymes have been classified on the basis of reactions they perform. With the help of enzymatic reactions describe the enzyme classification.

12

- b) Which technique can be used for enzymatic analysis when the reactants and products are in gaseous phase? Explain with the help of diagram.

8

- Q.3 a) With the help of example, show how protein sequencing can be used for characterization of enzymes?

10

- b) Explain the various methods for cell disruption during protein purification.

5

- c) What is the principle of spectrofluorimetry? With the help of diagram explain the working of instrument.

5

- Q.4 a) Write in detail about the surface immobilization of enzymes. State the advantages and disadvantages of various methods.

10

- b) Write a note on Lactose intolerance and application of immobilized enzymes in medical field.

10

**PART-B**

- Q.5 a) Differentiate between competitive and non-competitive inhibition.

5

- b) Every enzyme has an optimum temperature and pH on which it acts best. How temperature and pH effect the enzyme activity?

5

- c) Define the term enzyme engineering. Write in detail about the approaches to create novel enzymes?

10

- Q.6 a) Glucose syrup have been an important ingredient in food industry. Write in detail about the production of glucose syrup from starch. 10

- b) With the increased demand of enzymes in industries and daily needs, discuss the status of enzyme business in India and abroad. 10

- Q.7 With the help of diagram, describe about the components of basic biosensor. Write about the principle and applications of:

- a) Potentiometric biosensor.
- b) Amperometric biosensors.
- c) Piezo-electric biosensor.
- d) Thermometric biosensors.

5x4

**End Semester Examination, May 2017**  
**B. Tech.–Fifth Semester**  
**BIOINFORMATICS (BT-504)**

Time: 3 hrs

Max Marks:100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

**Q.1 Answer Briefly:**

- a) NAME TWO GENOMIC DATABANK.
- b) WHAT DO YOU MEAN BY WAN?
- c) HOW PRIMARY DATABASE IS DIFFERENT FROM SECONDARY DATABASE?
- d) HOW PAIR WISE SEQUENCE ALIGNMENT IS RELATED TO HOMOLOGY STUDIES?
- e) ENLIST CHALLENGES FACED IN INTEGRATION OF BIOLOGICAL SYSTEMS.
- f) WHAT IS THE ROLE OF DDBJ?
- g) EXPAND THE PIR FORMAT.
- h) ENUMERATE THE ADVANTAGES OF HOMOLOGY MODELLING?

2½x8

**PART-A**

- |            |  |                     |
|------------|--|---------------------|
| <b>Q.2</b> | <ol style="list-style-type: none"> <li>a) HOW INTERNET, INTRANET AND EXTRANET ARE DIFFERENT FROM EACH OTHER?</li> <li>b) DISCUSS HISTORY OF COMPUTER GENERATIONS.</li> </ol> | <p>10</p> <p>10</p> |
| <b>Q.3</b> | <ol style="list-style-type: none"> <li>a) WHAT DO YOU MEAN BY AUTOMATED CHAIN TERMINATION?</li> <li>b) DISCUSS ANY TWO SANGER'S DNA SEQUENCING METHOD?</li> </ol>            | <p>6</p> <p>14</p>  |
| <b>Q.4</b> | <ol style="list-style-type: none"> <li>a) BRIEFLY EXPLAIN GENBANK AND EMBL DATABANK.</li> <li>b) DATABASES ARE HEART OF BIOINFORMATICS, JUSTIFY.</li> </ol>                  | <p>10</p> <p>10</p> |

**PART-B**

- Q.5** ALIGN THE GIVEN SEQUENCE USING DYNAMIC PROGRAMMING FOR THE GIVEN SEQUENCES ACCGTT AND AGCGAT UPTO TRACE BACK USING +1, -1 AND 0 FOR MATCH, MISMATCH AND GAP PENALTY RESPECTIVELY.  
20
- Q.6**
  - a) HOW MULTIPLE SEQUENCE ALIGNMENT IS HELPFUL IN EVOLUTIONARY STUDIES? JUSTIFY USING AN EXAMPLE.  
8
  - b) What are the different methods used for multiple sequence alignment? 12
- Q.7** Write short notes on:  
  - a) Fold recognition and prediction. 10
  - b) Protein classification. 10

**End Semester Examination, May 2017**  
**B. Tech.–Fifth Semester**  
**DOWNSTREAM PROCESSING(BT-505A)**

Time: 3 hrs

Max Marks:100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Briefly answer:

a) *What is concentration polarization?*

4

b) *Define 'distribution coefficient' and 'adsorption isotherm'.*

3

c) *What are the factors that affect cell disruption in a homogenizer?*

3

d) *What do you understand by tangential flow (crossflow) filtration?*

2

e) *What is selective denaturation?*

2

f) *How can we determine size of nucleic acids using agarose gel electrophoresis?*

3

g) *Briefly explain the elution methods in affinity chromatography*

3

**PART-A**

Q.2 a) *What is the need of downstream processing in biotechnology?*

b) *What are the unique properties of bio-products?*

c) *How does upstream processing affect the choice of downstream processing unit operations?*

d) *Explain a case study elucidating typical downstream operations in bioprocess industry.*

5x4

Q.3 a) *Discuss the physico-chemical basis of separation in different downstream processing operations such as i) Filtration ii) Distillation iii) Reverse phase chromatography iv) Electrophoresis.*

8

b) *How do properties of bio-products affect downstream operations?*

4

c) *Classify bio-products giving suitable examples.*

8

Q.4 a) *Explain the mechanical methods used for cell disruption. Elaborate the disruption kinetics in ball mill.*

8

b) *Explain the construction and working of tubular bowl centrifuge.*

8

c) *Give Kozeny-Carmen equation of filtration. Explain its terms.*

4

**PART-B**

Q.5 Write detailed notes on:

- a) Adsorption.
- b) Supercritical fluid extraction.
- c) Membrane based separations
- d) Protein precipitation

5x4

**Q.6** a) Explain the technique and instrumentation in HPLC in detail.

10

b) Discuss the need of following reagents in SDS-PAGE:

- i) TEMED.
- ii) Bisacrylamide.
- iii) BromophenolBlue.
- iv) Methanol- Acetic acid-water.

10

**Q.7** a) Describe Mier's theory of crystallization.

8

b) Explain the construction and working of any one type of industrial crystallizer.

8

c) What is lyophilization? Discuss its various applications.

4

# End Semester Examination, May 2017

B. Tech.— Fifth Semester

## ANIMAL BIOTECHNOLOGY (BT-506A)

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Answer the following:

- a) What is the role of CO<sub>2</sub> in maintaining cell lines?
- b) Enumerate the limitations of retroviral vector method for production of transgenic animals.
- c) Enlist the features of expression vector.
- d) Differentiate between 'normal cells' and 'cancer cells'.
- e) Briefly explain the commercial value of stem cell banking. 4 × 5

### PART-A

- Q.2
  - a) Explain the basic techniques in animal cell culture.
  - b) What are serum free media and the need for it in animal cell culture? 10 × 2
- Q.3 Explain the mechanism and procedure for cryogenic storage of animal cell culture. 10 × 2
- Q.4
  - a) How detection of transgene integration and function is done? 10
  - b) Discuss the techniques:
    - i) Nuclear transfer method.
    - ii) In Vitro fertilization. 5 × 2

### PART-B

- Q.5 Write short notes on:
  - a) Molecular maps.
  - b) RFLP. 10 × 2
- Q.6
  - a) Explain the mechanism of antisense RNA.
  - b) What is cancer? Explain the causes of cancer in detail. 10 × 2
- Q.7
  - a) Describe isolation and culture of stem cells in detail.
  - b) Discuss the current role of stem cells in Indian market. 10 × 2

**End Semester Examination, May 2017**  
**B. Tech.— Fifth Semester**  
**FOOD BIOTECHNOLOGY (BT-507)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Answer briefly the following:

- a) Explain how biotechnology is applied to food industry?
- b) Give two examples of microbes used in oil industry.
- c) What is meant by SPC?
- d) What are the internal barriers in egg that preserves it?
- e) What are Agar droplets?
- f) Differentiate between Yeast and Molds.
- g) How are colors relevant to food industry?
- h) When was the first SCP produced?
- i) Name two enzymes that are important in dairy industry.
- j) Which two industries contribute maximum towards food waste? 2 × 10

**PART-A**

- Q.2
  - a) What are the primary sources of microorganisms found in food? 10
  - b) Give a detailed synopsis of different genera of bacteria common to food. 10
- Q.3
  - a) Give an account of various extrinsic and intrinsic parameters that affect the growth of microorganisms in food. 10
  - b) Discuss about the spoilage of seafood. Give examples for the type of microbes involved in the process. 10
- Q.4 Explain in detail the different methods used for enumeration of microorganisms in food. 20

**PART-B**

- Q.5
  - a) Explain with appropriate examples, the role of radiation in food preservation. 10
  - b) Give a detailed account of the role of different organisms in the process of fermentation. 10
- Q.6
  - a) Discuss in detail the protocol for production of alcoholic beverages on industrial scale. 10
  - b) What are food yeasts and algal proteins? What are they referred to as commonly? What is their utility and explain the process of their production? 10
- Q.7 Discuss the role of enzymes in dairy and bakery industry. Explain with appropriate examples. 20

# End Semester Examination, May 2017

B. Tech.–Sixth Semester

## PLANT BIOTECHNOLOGY (BT-601A)

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer briefly:

- a) Mention the factors that lead to de-differentiation of plant tissues in culture.
- b) What are the beneficial uses of cybrids?
- c) State an approach to enhance the efficiency of symbiotic nitrogen fixation.
- d) Give two examples of molecular tagging of genes.
- e) How are binary vectors useful?

4 × 5

### PART-A

- Q.2 a) Describe the process of ovule culture. 10  
b) Enlist the factors affecting gynogenesis in plants. 10
- Q.3 a) Explain various methods of protoplast fusion. 10  
b) Discuss the genetic basis of somaclonal variations in plants grown in vitro. 10
- Q.4 a) Describe the process of nodulation and symbiotic nitrogen fixation in legumes. 10  
b) What is meant by terms 'symbiosis' and 'antibiosis'? Explain with examples. 10

### PART-B

Q.5 Write short notes on:

- a) Creve silencing through mi RNA. 10
- b) Post translational modifications. 10

- Q.6 a) Describe the mechanism of T-DNA transfer from agrobacterium to host cell. 12  
b) How are transposons suitable as vectors? 8

- Q.7 a) What is the role of flavonoids in conferring tolerance/resistance against stress in plants? Explain. 12  
b) What is the genetic mechanism of fruit ripening? How can it be delayed? 8



**End Semester Examination, May 2017**  
**B. Tech.–Sixth Semester**  
**ENVIRONMENT BIOTECHNOLOGY (BT-602A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer briefly:

- a) What can be the hierarchy of preferred waste management options according to you? Justify the answer.
- b) Give significance of preliminary treatment in wastewater.
- c) Explain the term cleaner technology.
- d) What are the different types and applications of biofuels?
- e) What do you understand by cometabolism?

4 × 5

**PART-A**

- Q.2 a) How is polluted water responsible to disturb ecological balance? Discuss about its sources, effect and management. 10
- b) "The ecological impact of global warming is quite serious". Comment. 10
- Q.3 a) Enumerate the advantages and disadvantages of anaerobic bioreactors for waste water treatment. 7
- b) Explain the tertiary waste water treatment? How is nitrogen removed from waste water by advanced treatment? 13
- Q.4 a) Explain the characteristics and treatment technologies for hospital waste management. 15
- b) Write a short note on 'sanitary landfill'. 5

**PART-B**

- Q.5 a) Discuss the functions of enzymes associated with xenobiotic metabolism. 10
- b) Compare the Phase I and Phase II reactions of xenobiotic metabolism. 10
- Q.6 a) What is bioremediation? Why is it preferred over physical and chemical methods of environmental clean-up? 10
- b) Enlist the advantages and disadvantages of using plants in remediation. 10
- Q.7 Write short notes on the following:
- a) Biomining.
- b) Vermicomposting.

10 × 2

**End Semester Examination, May 2017**  
**B. Tech.–Sixth Semester**  
**PHARMACEUTICAL TECHNOLOGY (BT-621A1)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer briefly:

- |  |   |
|--|---|
| a) Give the conditions for acceptable advertisements under Drugs and Magic Remedies Act. | 3 |
| b) How does drug solubility affect drug distribution?                                    | 3 |
| c) Explain drug incompatibility with the help of suitable examples.                      | 3 |
| d) Differentiate between dry and wet granulation.  | 3 |
| e) What do you understand by pharmacokinetics and pharmacodynamics?                      | 3 |
| f) Describe different types of problems in tablet coating.                               | 3 |
| g) Enlist the different types of sterile dosage forms.                                   | 2 |

**PART-A**

- |     |   |       |
|-----|---|-------|
| Q.2 | a) What are the powers given to inspectors in the Drugs and Cosmetics Act?  | 10    |
|     | b) What are the labeling requirements for drugs in Drugs and Cosmetics Act?   | 10    |
| Q.3 | Give a classification of pharmaceutical dosage forms. Explain the characteristic and features of oral route of drug delivery in detail. | 20    |
| Q.4 | Discuss the importance and examples of following types of additives in drug formulations:   |       |
|     | a) Binders.   |       |
|     | b) Emulsifiers.   |       |
|     | c) Sweeteners.  |       |
|     | d) Preservatives.   |       |
|     | e) Fillers.   | 4 × 5 |

**PART-B**

- |     |  |       |
|-----|--|-------|
| Q.5 | a) Elaborate the manufacturing process of capsules in detail.                                    | 10    |
|     | b) Write in detail about quality testing of tablets.   | 10    |
| Q.6 | a) Describe the characteristics and applications of different types of ointment bases in detail. | 10    |
|     | b) Explain the formulation, manufacturing and packaging of syrups in detail in detail.           | 10    |
| Q.7 | Write short notes on the following:  |       |
|     | a) Bioavailability.  |       |
|     | b) Dose response curves.   |       |
|     | c) Bioequivalence.   |       |
|     | d) Drug accumulation.  | 5 × 4 |

# End Semester Examination, May 2017

## B. Tech.–Sixth Semester HUMAN GENOMICS (BT-621B)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q. 1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1 Explain briefly:
- |   |   |
|---|---|
| a) Reverse genetic approach.              | 4 |
| b) Disease associated with y chromosomes. | 4 |
| c) DNS/RNA probes.                        | 2 |
| d) Karyotype analysis.                    | 4 |
| e) Maternal-fetal incompatibility.        | 4 |
| f) DNA markers.                           | 2 |

### PART-A

- Q.2 a) Discuss morphology of human chromosomes. 8  
 b) What are the important genes associated with them? Explain any one in brief. 12
- Q.3 What do you mean by disease gene versus susceptibility? Discuss diseases associated with X-chromosome. 20
- Q.4 Explain any technique associated with detection of genetic disease. What do you mean by DNA/RNA probes? 20

### PART-B

- Q.5 Discuss general rules followed in autosomal recessive inheritance. How pedigree analysis is helpful in identification of a genetic disease? 20
- Q.6 a) How pedigree analysis is helpful in identification of genetic disease? 10  
 b) Discuss general rules followed in autosomal dominant inheritance. 10
- Q.7 Write short notes on (*ANY TWO*):
- |                                |      |
|--------------------------------|------|
| a) Genetic counseling.         |      |
| b) Immunology in gene therapy. |      |
| c) Augmentation gene therapy.  | 10×2 |

**End Semester Examination, May 2017**  
**B. Tech.–Sixth Semester**  
**BIOMATERIALS AND DRUG DELIVERY (BT-622A1)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer briefly:

- a) What is meant by the term 'biocompatible'?
- b) Give two examples of metallic biomaterials with their expanded forms.
- c) What does PGA stands for in biomaterials?
- d) Describe 'a giant cell'.
- e) What is meant by scaffold fabrication?
- f) Differentiate between bioerosion and biodegradation.
- g) What are transosseous implants?
- h) Which polymer is used as bone cement?
- i) Differentiate between BIM and BCM.
- j) Name two main host reactions to biomaterials.

2 × 10

**PART-A**

Q.2 Explain the basis for the classification of biomaterials. If given a chance, how would you classify the biomaterials? Describe all the classes that you will include in your classification system. 20

Q.3 Give an account of the host responses to biomaterials. What are the various interactions that occur at the implant surface inside the host? 20

Q.4 a) What are the various types of targeted and controlled drug delivery systems? 10  
 b) Discuss the differences between traditional and controlled delivery methods and advancements in the latter system. What are the major challenges being faced in their design and delivery? 10

**PART-B**

Q.5 a) What are hydrogels? Explain their applications as controlled drug delivery systems. 10  
 b) Discuss the kinetics of drug diffusion through hydrogels in detail. 10

Q.6 What are biominerals? Discuss the role of biominerals in device applications and drug delivery in detail. 20

Q.7 What is drug targeting? How nanotechnology is helping in the process of drug delivery? Enumerate various materials being used in anti-cancer drug delivery in detail. 20

**End Semester Examination, May 2017**  
**B. Tech.–SixthSemester**  
**STEM CELLS IN HUMAN HEALTH (BT-623A1)**

Time: 3 hrs.

Max Marks:100

No. of pages:1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer briefly:

- a) Differentiate between Totipotent, Multipotent and Unipotent.
- b) List the roles of cyclins and cyclin dependent kinases in cell cycle control.
- c) What is lymphopoiesis? Explain its importance in human life.
- d) Give different types of germ cell tumors.
- e) How do we culture stem cells?

4 × 5

**PART-A**

- Q.2 a) Explain the fate mapping of stem cells in detail. 10  
 b) What are hematopoietic stem cells? Where do HSCs come from? 10
- Q.3 Write short notes on:  
 a) Differentiated parental DNA chain causes stem cell pattern of cell type. 10  
 b) Senescence of dividing somatic cells. 10
- Q.4 a) Give a schematic representation of a common view of germ cell tumor histogenesis and its parallel with embryogenesis. 10  
 b) What are sources of ES cells? How are ES cells different from other stem cells and what are ES cells used for? 10

**PART-B**

- Q.5 Discuss the therapeutic potential of mesenchymal stem cells in regenerative medicine. 20
- Q.6 a) Discuss the recent advances of stem cells in the developing neuron system. 10  
 b) Describe the role of multipotent cells in normal development of nervous system. 10
- Q.7 a) Discuss the role of stem cells in liver repair in detail. 10  
 b) What are the effects of injury on epithelial stem cells? 10

**End Semester Examination, May 2017**  
**B. Tech.– Seventh / Eighth Semester**  
**BIOSAFETY AND IPR (BT-702)**

Time: 3 hrs

Max Marks:100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

Q.1 Answer briefly:

- a) Define 'ethics and moral values'.
- b) What are GMO's? Give any two examples.
- c) Why there is need of biosafety for sustainable environment development?
- d) Discuss any two NIH guidelines for biosafety.
- e) Explain some of the risks associated with genetic engineering.
- f) What conditions an innovation must fulfill in order to become eligible for a patent?
- g) Differentiate between 'trademark' and 'trade secret'.
- h) Discuss 'bioterrorism'.
- i) What do you mean by biological containment?
- j) How disposal of un-chlorinated waste is done?

2x10

**PART-A**

- Q.2 a) Discuss the problems associated with ethics with suitable example. 10  
 b) Explain the key provision in the convention on biological diversity. 10

- Q.3 a) What are the ethical dimensions of IPR? 10  
 b) Discuss the benefits of globalization in biotechnology. 10

- Q.4 a) Explain the perception of risks and benefits for biosafety. 10  
 b) Discuss biosafety assessment of biotech products. 10

**PART-B**

- Q.5 a) Explain different levels of bio-safety with example. 10  
 b) Write down short note on Cartagena protocol on biosafety. 10

Q.6 Write short notes on the following:

- a) Basic requirements of patent. 10
- b) Competitive research vs. Collaborative research. 10

- Q.7 a) Describe enforcement of farmers' rights in India. 10  
 b) Discuss recent development in patent system. 10

**End Semester Examination, May 2017**  
**B. Tech.–SeventhSemester**  
**DNA MICROARRAY AND APPLICATIONS(BT-703)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q. 1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

**Q.1 Answer briefly:**

- a) HOW HIGH THROUGHPUT TECHNOLOGY HELPS IN MICROARRAY ANALYSIS?
- b) WHAT IS THE ROLE OF DYE BIAS IN GLOBAL NORMALIZATION PROCESS?
- c) HOW IS PROMOTER ANALYSIS DONE?
- d) HOW ONE CAN DETERMINE WHERE THE PRIMER IS BINDING IN GENOME?
- e) WHAT IS THE ROLE OF DISTANCE MEASURE IN CLUSTER ANALYSIS?
- f) NAME TWO TAGGING ENZYMES USED IN SAGE ANALYSIS.
- g) HOW SNPS ARE HELPFUL IN DNA MICROARRAY EXPERIMENT?
- h) HOW GRIDDDING HELPS IN IMAGE ANALYSIS?
- i) WHAT ARE THE FACTORS THAT AFFECTSHETERODUPLEX FORMATION IN THE PROCESS OF HYBRIDIZATION?
- j) ENLIST FOUR DIFFERENCES BETWEEN 'cDNA AND mRNA'.

**2x10**

**PART-A**

**Q.2** How SOM IS DIFFERENT FROM K-MEAN CLUSTERING? EXPLAIN HIERARCHICAL CLUSTERING WITH SUITABLEEXAMPLES.

**20**

**Q.3** a) WHAT ARE THE DIFFERENT STEPS IN HYBRIDIZATION PROCESS?

**10**

b) DISCUSS DIFFERENT TECHNOLOGIES BEHIND GENE CHIPS IN DETAIL.

**10**

**Q.4** How is reduction and visualization of large data matrix done? Explain anyone method used tovisualize the data in detail.

**20**

**PART-B**

**Q.5** a) How does hypothesis driven experiments help in design of experiments?

**14**

b) Enumerate the advantages of independent verification in brief.

**6**

**Q.6** a) What do you mean by genotyping and re-sequencing chips?

**12**

b) Give an account of molecular classifiers used in microarray experiment in detail.

**8**

**Q.7** Explain different types of gene network in context to reverse engineering of regulatory network.

**20**

**End Semester Examination, May 2017**  
**B. Tech.–SeventhSemester**  
**DNA MICROARRAY AND APPLICATION(BT-703)**

Time: 3 hrs

Max Marks:100

No. of pages: 1

Note: *Attempt FIVE questions in all;Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer briefly:

- a) Define 'high throughput technology'.
- b) What are the different bias studied by you in global normalization process?
- c) How function analysis is done?
- d) How one can determine where the primer is binding in genome?
- e) What is the role of distance measure in cluster analysis?
- f) Name two anchoring enzyme used in SAGE analysis.
- g) How SNPs are helpful in DNA microarray experiment?
- h) How back ground correction helps in image analysis?
- i) Enlist the advantages of feature selection.
- j) Enlist four differences between 'phenotype' and 'genotype'.

2x10

**PART-A**

Q.2 Discuss the algorithms for clustering in:

- a) Hierarchical clustering.
- b) K-mean clustering.

10

10

Q.3 a) What is the purpose of hybridization in DNA microarray technology? Explain.

10

b) How data analysis is performed in DNA microarray?

10

Q.4 a) How reduction and visualization of large data matrices is done?

10

b) What are the steps followed in SAGE analysis?

10

**PART-B**

Q.5 a) How hypothesis driven experiments help in design of microarray experiments?

14

b) Enumerate the advantages of independent verification.

6

Q.6 a) What do you understand by 'molecular classifiers'?

8

b) Discuss the need of factorial design in DNA microarray experiment evaluation.

12

Q.7 Explain different types of gene networks in context to reverse engineering of regulatory network.

20



**End Semester Examination, May 2017**  
**B. Tech.— Seventh Semester**  
**CHEMO INFORMATICS AND DRUG DESIGN (BT-821A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Briefly answer:

- a) State Lipinski rule of five?
- b) What is SMILE?
- c) What do you mean by 1D, 2D and 3D molecular descriptors?
- d) Explain de novo ligand design?
- e) Discuss reapplications of genetic algorithm in QSAR modeling.
- f) What do you mean by 3D pharmacophore?
- g) Discuss applications of chemo informatics.
- h) What do you mean by ADME?

2½ × 8

**PART-A**

Q.2 Discuss the role of graph theory in comparing two structures. Explain the different methods of pharmacophore identification in detail. 20

Q.3 What do you mean by molecular fingerprints? Give an account of physiochemical properties of pharmacophore. 20

Q.4 How chemical properties of a compound are calculated? What do you mean by structural similarity and diversity? 20

**PART-B**

Q.5 What are the chemical libraries? Discuss structure based virtual screening with suitable examples. 20

Q.6 a) What do you mean by genetic algorithm? 10  
 b) Give an account of structure based method to identify lead compounds. 10

Q.7 Write short notes on:

- a) QSARs.
- b) Molecular docking.

10 × 2

**End Semester Examination, May 2017**  
**M.Tech. (Biotechnology) – Second Semester**  
**ADVANCED PLANT BIOTECHNOLOGY (BT-M-202A)**

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt FOUR more questions out of six, taking at least ONE question from each unit. Each question carries equal marks.*

Q.1 Answer briefly:

- a) How is in-vitro fertilization different from normal fertilization?
- b) Define "Cellular Totipotency". How is this phenomenon important in plant tissue culture?
- c) What do you understand by the term "high yielding cell line" in large scale production of secondary metabolites using genetically-engineered plant cell cultures?
- d) How can RNAi be useful in plant biotechnology?
- e) Differentiate between Redifferentiation and Dedifferentiation. 3x5

**UNIT-I**

- Q.2
  - a) Define somatic embryogenesis. Explain direct and indirect somatic embryogenesis. 6
  - b) Explain meristem culture with the help of a diagram. State its advantages. 6
  - c) Differentiate between Somaclonal variations and Gametoclonal variations. 3
- Q.3
  - a) Protoplast culture is known to be a good tool in plant biotechnology. With the help of a diagram, describe its isolation and culture method in detail. 8
  - b) What term has been given to produce a plant having 3n number of chromosomes? With the help of a diagram show the process in detail. 7

**UNIT-II**

- Q.4
  - a) How can large scale production or accumulation of secondary metabolites be achieved by elicitor-induction? 8
  - b) Define the term: "biotransformation". How can this technique be used for large scale production of plant cell culture? 7
- Q.5
  - a) How can secondary metabolite be produced using genetically engineered plant cell cultures? 8
  - b) Why and how plant cells can be mass cultured? 4
  - c) Explain the functions of flavonoids in plants. 3

**UNIT-III**

- Q.6
  - a) What do you understand by the term: "gene silencing"? With the help of an example explain, how can this technique be used for the production of genetically engineered plants? 10
  - b) Enumerate the various methods being employed for plant germplasm conservation. 5
- Q.7
  - a) What does BT stand for in "BT Cotton". State the mechanism how BT cotton is helpful in killing of lepidopteron population. 8

- b) There is a lot of hue and cry about the consumption of GM food. Write your views about the various food safety parameters which should be taken care of. **7**

**End Semester Examination, May 2017**  
**M. Tech.(Biotechnology) – SecondSemester**  
**ENVIRONMENTAL BIOTECHNOLOGY (BT-M-203)**

Time: 3 hrs.

Max Marks:75

No. of pages:1

Note: *Attempt FIVE questions in all. Q.1 is compulsory. Attempt FOUR questions from remaining SIX, selecting at least ONE from each PART. All questions carry equal marks.*

Q.1 Briefly answer:

- a) Write a brief note on role of genetic engineering in Phytoremediation.
- b) Enumerate the advantages and disadvantages of anaerobic bioreactors for waste water treatment.
- c) What are hyperaccumulators?
- d) Differentiate between bioprospecting and biopiracy.
- e) What is the significance of keystone species?

3 × 5

**PART-A**

- Q.2 a) Describe the physical, chemicals and biological properties of wastewater. 6
- b) Enlist the effluents present in dye industry. Explain the cleaner technology for removal of specific pollutants of the dye industry. 9
- Q.3 a) Explain the process, modifications and limitations of activated sludge treatment in detail with diagrams. 8
- b) Write a detailed note on tertiary waste water treatment. 7

**PART-B**

- Q.4 a) What are the most common mechanisms of metal transportation into the cells? 8
- b) Enlist the biotic and abiotic factors affecting the bioavailability of metals. 7
- Q.5 a) Explain the in situ technologies for Bioremediation. Enlist the advantages and disadvantages of Bioremediation. 10
- b) Give an example of bioremediation in India. 5

**PART-C**

- Q.6 a) The local and indigenous knowledge of flora and fauna is important for sustainable livelihoods. Comment and explain. 8
- b) Discuss the global and regional challenges in the path of sustainable development. 7
- Q.7 a) What is biological diversity? Give a detailed account of hot-spots of Indian biodiversity. 9
- b) What are the major conservation categories according to IUCN? 6

**End Semester Examination, May 2017**  
**M. Tech.(Biotechnology) – SecondSemester**  
**STEM CELL BIOLOGY (BT-M-221D)**

Time: 3 hrs.

Max Marks:75

No. of pages:1

Note: *Attempt FIVE questions in all. Attempt FOUR questions from remaining SIX, selecting at least ONE from each PART.Q.1 is compulsory. All questions carry equal marks.*

Q.1 Answer the following in brief:

- a) What are Sertoli cells?
- b) What are the major steps in fertilization?
- c) What do you mean by cell fate?
- d) Enlist the properties of totipotency and pluripotency.
- e) What are cancer stem cells?
- f) What tissues does the ectoderm become partitioned into during neurulation?
- g) Explain the term stem cell niche.
- h) Name three stem cell markers?
- i) What is Epigenetics?
- j) What are the advantages in using adipose stem cells for cell therapy? 1½ × 10

**PART-I**

Q.2 What is gametogenesis? Explain the phenomenon of spermatogenesis. Mention the role of hormones in spermatogenesis. 15

Q.3 Differentiate between:

- a) Morula and Blastula. 8
- b) Cell determination and Cell differentiation. 7

**PART-II**

Q.4 a) Discuss the stem cell niche in the maintenance of epidermal stem-cells. 8  
 b) Give a brief account of Notch signaling pathway. 7

Q.5 a) What is stem cell renewal? How do the stem cells age? 7  
 b) What do you understand by cancer stem cells? Explain BMI 1 signaling pathway. 8

**PART-III**

Q.6 Write short notes on:

- a) Nuclear cloning. 7
- b) Endothelial stem cells. 8

Q.7 What are stem cells markers? Describe the embryonic stem cell markers. 15

**End Semester Examination, May 2017**  
**M.Tech. (Biotechnology) – Second Semester**  
**STEM CELLS BASED TISSUE ENGINEERING (BT-M-222D)**

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt FOUR more questions out of six, taking at least ONE question from each unit. Each question carries equal marks.*

- Q.1
- a) What are biometric bioreactors?
  - b) Give examples of two angiogenic factors.
  - c) Define the term 'Vascularization'.
  - d) What is meant by bioscaffolds?
  - e) Explain the term 'tissue engineering'.
  - f) What is Vasculogenesis?
  - g) What is meant by native tissue? Mention the properties of native tissues in brief.
  - h) Mention various mechanical signals in engineered tissues.
  - i) Explain 3D cell growth.
  - j) What are autologous cells?
- 1½x10

**UNIT-I**

- Q.2
- a) What are the major advantages of using bioscaffolds in tissue engineering?
  - b) Explain how bioscaffolds are designed for tissue engineering in detail.
- 7½x2
- Q.3
- Discuss the source of genetically engineered cells source. Explain the properties of different sources of cells for transplant in detail.
- 15

**UNIT-II**

- Q.4
- a) What are different biomolecules used in TE?
  - b) Explain the application and working of differentiation factors and bone morphogenic proteins.
- 7½x2
- Q.5
- a) Describe cell adhesion and function in detail.
  - b) Explain the process of vascularization in brief.
  - c) Discuss about the steps involved in biological packaging in brief.
- 5  
5  
5

**UNIT-III**

- Q.6
- Enumerate the properties of native tissues. Explain in detail the efficacy and safety of engineered tissues in detail.
- 15
- Q.7
- Describe in detail how mechanical signals work in engineered tissues?
- 15

**End Semester Examination, May 2017**  
**M.Tech. (Biotechnology) – Second Semester**  
**STEM CELL BASED TISSUE DEVELOPMENT(BT-M-223D)**

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt FOUR more questions out of six, taking at least ONE question from each unit. Each question carries equal marks.*

Q.1 Answer briefly:

- a) What is Fate mapping?
- b) Differentiate between 'Anaesthesia' and 'Euthanasia'.
- c) Give the function of collagen and fibronectin in animal tissues.
- d) How does a microcarrier help in scaling up?
- e) What is the source of Embryonic Stem Cells?

3x5

**UNIT-I**

Q.2 What is the need for the production of transgenic animals? Describe the methods for their production. 15

- Q.3
- a) Explain the events involved with the remodeling of the bone. 8
  - b) Discuss about the cellular effectors in wound healing process. 7

**UNIT-II**

- Q.4
- a) How does actin help some pathogens to move around in an infected cell and for transmission to other cells? 7
  - b) Explain in detail cell migration model. 8

- Q.5
- a) What do you understand by 'bioartificial liver'?
  - b) Discuss the treatments to cure liver failure.
  - c) Describe bioengineersimplantable device. 5x3

**UNIT-III**

Q.6 How tissue engineered products are regulated by FDA? 15

- Q.7
- a) Discuss briefly tissue engineering and scaffolds in stem cell research. 7½
  - b) What are the main considerations for transport of animals? 7½

**End Semester Examination, May 2017**  
**M.Sc. (Biotechnology)–First Semester**  
**CELL AND MOLECULAR BIOLOGY (BT-S-101A)**

Time: 3 hrs

Max Marks: 60

No. of pages: 1

Note: *Attempt any FIVE questions in all; Q.1 is compulsory. Taking at least ONE question from each Unit. All questions carry equal marks*

Q.1 Answer briefly:

- a) Why lipids in plasma membrane are called 'amphipathic molecules'?
- b) What are secondary messengers in signaling pathways?
- c) Which is the most important protein that drives the whole process of replication and why?
- d) Define 'RNA modification and its significance in biology'.
- e) What is spliceosome and what function does it perform?
- f) Define 'genome'.

2x6

**UNIT-I**

- Q.2 a) How are lipids in plasma membrane arranged and contributed towards general properties? 6
- b) What do you understand by the concept of fluidity of lipid bilayer? Which factors decide the degree of fluidity in membrane? 6
- Q.3 a) What is vesicular transport? How is it driven by the assembly of a protein a coat? 7
- b) Define 'signal transduction'. What are G-protein linked receptors and how do they mediate cell communication? 5

**UNIT-II**

- Q.4 a) What is the basis of replication of genetic material? Which is the best explained and accepted model of replication? How does it happen in Prokaryotes? 7
- b) How are the ends of chromosome replicated in Eukaryotes? 5
- Q.5 a) How does RNA polymerase initiate transcription at promoter region in Prokaryotes? 6
- b) How is the process of transcription terminated with and without rho proteins? 6

**UNIT-III**

- Q.6 a) What are the various steps which translate a m RNA into polypeptide in prokaryotes? 6
- b) How is the mechanism of translation different in eukaryotes? 6
- Q.7 What are genomic libraries? What do you understand by YAC and BAC libraries? 12



**End Semester Examination, May 2017**  
**M.Sc. (Biotechnology)–First Semester**  
**BIOSTATISTICS(BT-S-105A)**

Time: 3 hrs

Max Marks: 60

No. of pages: 1

Note: *Attempt any FIVE questions in all; Q.1 is compulsory. Taking at least ONE question from each Unit. All questions carry equal marks*

- Q.1 a) Write Karl Pearson's coefficient of correlation.  
 b) Write the relationship between mean, median and mode.  
 c) Write Karl Pearson's  $\beta$  and  $\gamma$  coefficients.  
 d) Explain a critical region and null hypothesis. 3x4

**UNIT-I**

- Q.2 a) Following grouped data is obtained in an observation of 'rate of reproduction' of 50 fishes of a species. Make a frequency polygon and frequency curve with the help of data provided:

Class interval(Ci)	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Frequency	3	4	7	8	9	9	2	6	2

12

- Q.3 a) Six coins are tossed 640 times. Using Poisson distribution, determine the approximate probability of getting six heads x times. 5  
 b) Write short notes on the following:  
 i) Skewness 7  
 ii) Kurtosis

**UNIT-II**

- Q.4 a) Explain types of sampling with examples of each. 6  
 b) A drug given to each of the 12 persons resulted in the following changes in the blood pressure from normal -3, 2, 8, -1, 3, 0, 7, -2, 1, 5, 0, 4. Then calculate by students 't' test whether changes is significant or not. 6

- Q.5 a) Define null hypothesis. Explain all the steps needed in order to test a hypothesis with the help of a suitable example. 6  
 b) In experiments on pea breeding, Mendel got the following frequencies of seeds: 315 round and yellow, 108 round and green, 32 wrinkled and green; total 556. Theory predicts that the frequencies should be in the proportion 9:3:3:1. Examine the correspondence between theory and experiment.  
 ( $\chi^2$  for 3 d.f at 5% level = 7.815). 6

**UNIT-III**

- Q.6 Obtain the rank correlation co-efficient for the following data:

X:	68	64	75	50	64	80	75	40	55	64
Y:	62	58	68	45	81	60	68	48	50	70

12

- Q.7 Find the co-efficient of correlation for the following table:

X	10	14	18	22	26	30
Y	18	12	24	6	30	36

**End Semester Examination, May 2017**  
**M.Sc. (Biotechnology) -Second Semester**  
**GENETIC ENGINEERING AND APPLICATION(BT-S-201A)**

Time: 3 hrs

Max Marks: 60

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Taking at least ONE question from each Unit. All questions carry equal marks.*

Q.1 Answer in brief:

- a) How is DNA purity determined?
- b) Mention the characteristic features of vectors.
- c) Name two DNA sequencing strategies.
- d) Differentiate between expression vector and cloning vector.
- e) What are isoschizomers?
- f) Mark the usage of linkers and adaptors.

2x6

**UNIT-I**

- Q.2 a) Explain in detail the steps involved in gene cloning. 6  
 b) Describe the procedure for nucleic acid purification. How to get rid of proteins while extracting out the nucleic acids? 6
- Q.3 What are the milestones in the advent of genetic engineering? What is the contribution of GE in today's scientific advancements? 12

**UNIT-II**

- Q.4 What is mRNA enrichment? What is its application in cDNA library preparation? 12
- Q.5 Explain the concept of site directed mutagenesis. Which application requires the involvement of SDM? 12

**UNIT-III**

- Q.6 What is phage display? Explain its application in antibody enrichment in detail. 12
- Q.7 Write short notes on:  
 a) Northern blotting.  
 b) Vector engineering.  
 c) Yeast Two Hybrid System. 4x3

**End Semester Examination, May 2017**  
**M. Sc. (Biotechnology) – Second Semester**  
**BIOPROCESS TECHNOLOGY (BT-S-202A)**

Time: 3 hrs.

Max Marks: 60

No. of pages: 1

Note: *Attempt FIVE questions in all. Attempt FOUR questions from remaining SIX, selecting at least ONE from each UNIT. Q.1 is compulsory. All questions carry equal marks.*

- Q.1 a) 'Bioprocesses are less polluting as compared to the chemical processes' justify.  
 b) What are the disadvantages of cell counting by 'hemocytometer'?  
 c) List three important reasons of non-ideality in reactors.  
 d) Briefly explain the factors that affect choice of carbon source.  
 e) What are the factors that affect mass transfer by convection?  
 f) What is  $K_L a$ ? 2 × 6

**UNIT-I**

- Q.2 a) What is the significance of the term: 'Saturation constant,  $K_s$  in Monod's model? 6  
 b) Explain 'fed batch culture' and different feeding strategies used in fed batch culture. 6
- Q.3 a) What are the terms in general energy-balance equation? Derive the energy balance equation for steady state adiabatic process. 6  
 b) Describe cell growth kinetics in ideal batch reactor. 6

**UNIT-II**

- Q.4 a) What is 'Residence Time Distribution'? How does it contribute to non-ideality in bioreactors? 6  
 b) Compare the batch and continuous reactors with respect to their operation, application and limitations. 6
- Q.5 a) What are the ideal characteristics of packing material in packed bed reactors? 6  
 b) Describe the construction and working of airlift reactors. Enlist important applications of air lift reactors. 6

**UNIT-III**

- Q.6 a) How does quality of water affect preparation of culture medium? 3  
 b) Compare defined and undefined media for different bioprocessing applications. 3  
 c) Explain the design of batch sterilization process in detail. 6
- Q.7 Write short notes on the following:  
 a) Role of diffusion in bioprocessing.  
 b) Sulphite oxidation method for determination of  $K_L a$ . 6 × 2

**End Semester Examination, May 2017**  
**M. Sc.(Biotechnology) – SecondSemester**  
**IMMUNOLOGY (BT-S-203A)**

Time: 3 hrs.

Max Marks:60

No. of pages:1

Note: *Attempt FIVE questions in all;taking at least ONE question from each UNIT.*  
*Q.1 is compulsory. All questions carry equal marks.*

Q.1 Answer briefly:

- a) Differentiate between 'haptens'and'adjuvants'.
- b) What do you understand by 'opsonization'?
- c) Differentiate between 'agglutination'and'precipitation'.
- d) What is humoral immune response?
- e) How does IgE different from IgA?
- f) What is the role of macrophages in generating immunity?

2×6

**UNIT-I**

- Q.2 a) How an antigen is different from a superantigen? 4  
 b) Discuss the structure & function of thymus. 8
- Q.3 What is immunoglobulin? Diagrammatically explain the structure of different classes of antibodies and their function. 12

**UNIT-II**

- Q.4 a) Explain the structural difference between MHC Iand MHC II molecules. 8  
 b) How antigens are processed through cytosolic pathway? 4
- Q.5 a) What are cytokines? Describe how the expression of cytokines and cytokine receptors has been implicated in diseases? 8  
 b) Explain diagrammatically cytokines selectively modulates the immune response. 4

**UNIT-III**

- Q.6 What do you understand by autoimmunity? Discuss the disease caused by direct cellular damage and by blockage or stimulating auto antibodies. 12
- Q.7 a) Briefly describe the mechanisms that come into play to eliminate the infecting bacteria. 8  
 b) Explain CTL- mediated killing of target cells. 4

**End Semester Examination, May 2017**  
**M.Sc. (Biotechnology) -Second Semester**  
**BIOINFORMATICS AND COMPUTATIONAL BIOLOGY(BT-S-204A)**

Time: 3 hrs

Max Marks: 60

No. of pages: 1

Note: *Attempt FIVE questions in all; taking at least ONE question from each UNIT. Q.1 is compulsory. All questions carry equal marks.*

Q.1 Answer briefly:

- a) How LAN is different from WAN?
- b) Enlist the application of Clustal W.
- c) In database search what is the role of n-BLAST?
- d) What information could be obtained from comparative genomics study?
- e) How FASTA format is different from EMBL format?
- f) What is Fold recognition?

2x6

**UNIT-I**

- Q.2 a) How are the sequenced DATA collected and stored in the laboratory? 8  
 b) Discuss the role of internet and World Wide Web in bioinformatics. 4
- Q.3 a) What do you mean by shotgun sequencing? 4  
 b) Discuss any two DNA sequencing methods. 8

**UNIT-II**

- Q.4 Align the given sequence using dynamic program in GATC and GAGC up to trace back using +1, -1 and -2 for match, mismatch and gap penalty respectively. 12
- Q.5 a) What is multiple sequence alignment? Discuss its significance and mention some tools use for MSA. 6  
 b) Differentiate between the following:  
 i) Orthodox and paradox.  
 ii) Parsimony and UPGMA. 2x3

**UNIT-III**

- Q.6 a) Discuss about the functional classification of Gene. 6  
 b) How promoter is predicted in prokaryotes and eukaryotes. 6
- Q.7 a) What is protein threading? How prediction is made by using protein threading? 6  
 b) What do you mean by 'alignment of protein structure'? 6

**End Semester Examination, May 2017**  
**M. Sc. (Biotechnology) — Second Semester**  
**HERBALOMICS (BT-S-205B1)**

Time: 3 hrs.

Max Marks: 60

No. of pages: 1

Note: *Attempt FIVE questions in all; taking at least ONE question from each unit. Q.1 is compulsory. Each question carries equal marks.*

Q.1 Briefly answer the following:

- a) Write down two examples of immuno-modulatory drug.
- b) Name any two herbal medicines for non-infectious diseases and cancer.
- c) What do you mean by herbal preparation?
- d) Define supercritical fluid extraction method.
- e) Write down the definition of primary and secondary metabolites.
- f) What is mass culture of plant cells?

2 × 6

**UNIT-I**

- Q.2 a) Discuss the expansion of complementary and alternative medicine (CAM) approaches. 8
- b) Write down name of two herbal plants and their uses in curing disease. 4
- Q.3 a) What are the benefits of herbal medicine over conventional therapies? 8
- b) Write down note on risk factors related to nutrition. 4

**UNIT-II**

- Q.4 a) Explain different methods for separation and identification of secondary metabolites. 12
- Q.5 Explain briefly:
- a) Traditional methods of extraction of secondary metabolites.
  - b) Factors affecting extraction of secondary metabolites.

6 × 2

**UNIT-III**

- Q.6 Discuss advances in tissue culture for synthesis of useful compounds with example. 12
- Q.7 Explain elicitor-induced accumulation of products in detail. 12

**End Semester Examination, May 2017**  
**B. Tech.–Second Semester**  
**CONSTRUCTION MATERIALS (C-201)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Write short notes on:

- a) Initial and final setting of cement.
- b) Rise husk ash.
- c) Properties of glass.
- d) Uses of lead in construction.
- e) Poor lime.
- f) Natural bed of stone.
- g) Ingredients of varnish.
- h) Properties of good mortar.
- i) Sedimentary Rocks.
- j) Asphalt.

2 × 10

**PART-A**

- |     |   |    |
|-----|---|----|
| Q.2 | a) Classify rocks. Write the properties of stone as a good construction material. | 10 |
|     | b) What are the harmful ingredients in brick earth?                               | 5  |
|     | c) Classify bricks.   | 5  |
| Q.3 | a) What are the functions of ingredients of ordinary Portland cement?             | 5  |
|     | b) Explain various varieties of terra-cotta being used in construction.           | 5  |
|     | c) Explain process of manufacturing of Portland cement.                           | 10 |
| Q.4 | a) Write different methods of seasoning of timber.                                | 5  |
|     | b) Write along with sketch four defects in timber.                                | 5  |
|     | c) Differentiate between burnt clay pozzolana and pulverized fly ash.             | 5  |
|     | d) Explain use of fly ash as supplementary cementitious material.                 | 5  |

**PART-B**

- |     |  |    |
|-----|--|----|
| Q.5 | a) What are the various tests performed on mortars. Explain any two of them in detail. | 10 |
|     | b) Write in detail about distempering.   | 10 |
| Q.6 | a) Define workability and explain its importance in detail.                            | 10 |
|     | b) What are various properties of mild steel?  | 5  |
|     | c) What is strength of concrete in compression?  | 5  |
| Q.7 | a) Explain various forms of Asphalt and differentiate between Bitumen and Coal Tar.    | 10 |
|     | b) Write in detail about the properties of plastics.                                   | 10 |

# End Semester Examination, May 2017

B. Tech.–Third Semester

## STRUCTURAL ANALYSIS I (C-301B)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

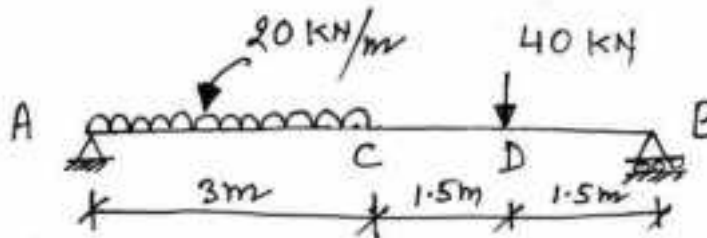
Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1
- Define the terms: 'bending moment' and 'shear force'.
  - Explain briefly the relationship between shear force and bending moment and loading at a section.
  - What is an influence line diagram?
  - Draw shorter than span udl positions for maximum shear (+ve and -ve) at a particular section.
  - A three hinged semi – circular arch of radius  $R$  carries audl  $w/m$  run over the whole span. Find the horizontal thrust.
  - What is the rise at quarter points of a parabolic arch?
  - Sketch any two types of roof trusses.
  - What are perfect, deficient and redundant trusses?
  - What are the limitations of Euler's theory?
  - Explain moment area first and second theorem.

2x10

### PART-A

- Q.2 Draw shears force and bending moment diagrams for the following beam:

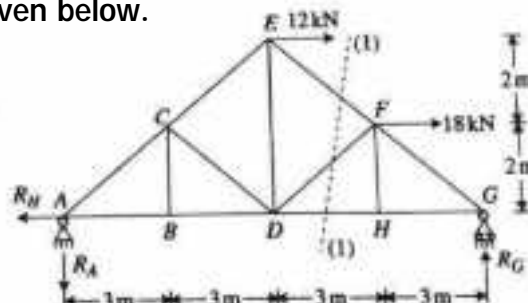


20

- Q.3 Uniformly distributed load of length 2.5m and intensity 25kN/m crosses a simply supported beam of span 9.5m from left to right. Find the value of
- Maximum negative and positive shear for a section 4.5m from left end. 6
  - Maximum bending moment for a section 4.5m from left end. 6
  - Absolute maximum bending moment. 8
- Q.4 A three hinged circular arch hinged at the crown and springing points has a span of 40m and a central rise of 8m. It carries audl of 20kN/m over the left half of the span together with a concentrated load of 100kN at the right quarter span point.
- Find the vertical reactions and horizontal thrust at the supports. 10
  - Find the normal thrust at a section 10m from left support. 5
  - Find radial shear at a section 10m from left support. 5

### PART-B

- Q.5 Determine the nature and magnitude of forces in the members EF, DF and DH cut by section 1-1 in the given below.



20



- Q.6    a) What are the assumptions of Euler's theory for long columns? 4  
      b) Derive Euler's formula for crippling load for both end hinged. 8  
      c) A mild steel tube 25mm internal diameter, 32mm external diameter, length 2 m is used as a column one end fixed and other end hinged. Calculate the Euler's buckling load using  $E = 2 \times 10^5 \text{ N/mm}^2$ . 8
- Q.7    a) What is the relationship between real beam and conjugate beam? 4  
      b) Find out the maximum slope and deflection for a cantilever beam with UDL on entire length using double integration method. 8  
      c) Find out the maximum slope and deflection of a simply supported beam carrying a concentrated load P at mid span. Use conjugate beam method. 8

**End Semester Examination, May 2017**  
**B. Tech.–Third Semester**  
**BUILDING CONSTRUCTION AND MATERIALS (C-302C)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer the following:

- a) Explain perpend.
- b) Draw king closer.
- c) What is hip?
- d) Where linoleum flooring is used?
- e) What do you understand by weep holes?
- f) What is internal damp proofing?
- g) Classify foundation.
- h) How walls are classified on basis of its function?
- i) What do you mean by reinforced concrete?
- j) Draw figure of chain dog.

2x10

**PART-A**

- Q.2 a) Differentiate between 'English bond' and 'Flemish bond' in brick masonry. 10  
 b) Compare stone masonry with brick masonry. 10

Q.3 Write short notes on:

- a) Glass partition.
- b) Masonry Cavity Wall.
- c) Asbestos cement partition.
- d) Precast concrete partition.

5x4

- Q.4 a) Define 'foundation'. Explain purpose of providing foundation. 5  
 b) Sketch different types of foundations. 15

**PART-B**

- Q.5 a) What are the different materials used for DPC. How DPC is effective in preventing dampness? 10  
 b) Explain any one method of treatment to basement in damp soil with a neat sketch. 10

Q.6 Write short notes on:

- a) Granolithic flooring.
- b) Tiled flooring.
- c) King post roof truss.
- d) Advantages and disadvantages of a flat roof.

5x4

- Q.7 a) Explain any two types of special concrete in detail. 10  
 b) How fly-ash block qualify as green building material? 10

# End Semester Examination, May 2017

## B. Tech.–Third Semester FLUID MECHANICS I (C-303)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.

Q.1 Write short notes on:

- a) Newtonian fluid and Non-Newtonian fluid.
- b) Capillarity.
- c) Laminar flow and turbulent flow.
- d) Uniform flow and non-uniform flow.
- e) Absolute pressure and gauge pressure.
- f) Bernoulli's theorem.
- g) Notches and weirs.
- h) Smooth bounding and rough bounding.
- i) Buckingham's  $\pi$ -theorem.
- j) Geometric similarity between model and prototype.

2x10

### PART-A

- Q.2 a) Explain Newton's Law of viscosity and its importance in fluid motion. Also discuss the effect of temperature on viscosity for condition of water and air. 10
- b) The surface tension of water in contact with air at 20°C is 0.0725 N/m. The pressure inside a droplet of water is to be 0.02 N/cm<sup>2</sup> greater than the outside pressure. Calculate the diameter of the droplet of water. 10
- Q.3 a) Define the equation of continuity. Obtain an expression for continuity equation for a three-dimensional steady incompressible flow. 10
- b) A 40cm diameter pipe, conveying water, branches into two pipes of diameters 30cm and 20cm respectively. If the average velocity in the 40cm diameter pipe is 3m/s, find the discharge in this pipe. Also determine the velocity in 20cm pipe if the average velocity in 30cm diameter pipe is 2m/s. 10
- Q.4 a) A pipe contains an oil of specific gravity 0.8. A differential manometer connected at the two points shows a difference in mercury level as 15cm. Find the difference of pressure at the two points. 6
- b) Explain the terms 'metacentre' and 'metacentric height'. 4
- c) What are the conditions of equilibrium of a submerged body? Explain with the help of neat sketches. 10

### PART-B

- Q.5 a) Water is flowing through a pipe having diameter 300 mm and 200 mm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 24.525 N/cm<sup>2</sup> and the pressure at the upper end is 9.81 N/cm<sup>2</sup>. Determine the difference in datum head if the rate of flow through pipe is 40 lit/sec. 10
- b) What is a venturimeter? Derive an expression for the discharge through a venturimeter. 10

- Q.6 a) Explain the concept of boundary layer over a flat plate with a neat sketch. Also, explain what is laminar sub-layer. 10
- b) What do you mean by separation of boundary layer? What are the different methods of preventing the separation of boundary layer? 10
- Q.7 a) What are the methods of dimensional analysis? Describe the Rayleigh's method for dimensional analysis. 10
- b) What do you mean by dimensionless numbers? Name any four and obtain their expression. 10

# End Semester Examination, May 2017

## B. Tech.–ThirdSemester SURVEYING I(C-304A)

Time: 3 hrs

Max Marks:100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- Explain two primary classes of surveying.
  - Define 'scale'.
  - What is a discrepancy?
  - Explain Gunter's chain.
  - Define 'check lines'.
  - Explain backbearing.
  - Define 'contour line'.
  - Differentiate between 'telescope normal' and 'telescope inverted'.
  - Define 'departure'.
  - Differentiate between 'datum' and 'benchmark'.

2x10

### PART-A

- Q.2
- Explain properly scale of chords with figure. Define shrunk scale. 10
  - A 20m, chain was found to be 10cms too long after chaining a distance of 1500m. It was found to be 18cm too long at the end of day's work after chaining a total distance of 2900m. Find the true distance if the chain was correct before commencement of work. 10
- Q.3
- Explain the errors in chaining. 10
  - In passing an obstacle in the form of a pond, stations A and D, on the main line, were taken on the opposite sides of pond. On the left of AD, a line AB, 200m long was laid down and a second line AC, 250m long, was ranged on the right of AD, the points B, D and C being in the same straight line BD and DC were then chained and found to be 125 m and 150m respectively. Find the length of AD. 10
- Q.4
- Explain the height of instrument method and differentiate it with rise and fall method. 10
  - In leveling between two points A and B on opposite banks of a river. The level was set up near A and staff readings on A and B were 1.285 and 2.860m respectively. The level was then moved and set up near B and the respective readings on A and B were 0.860 and 2.220m. Find the true difference of level between A and B. 10

### PART-B

- Q.5
- Explain in detail the different components of theodolite. 10
  - How would you measure with a theodolite?
    - Magnetic bearing of a line.
    - Deflection angles. 10
- Q.6
- Explain three point problem and two point problem with clear figures. 10
  - A tacheometer is set up at an intermediate point on a traverse course PQ and following observations are made on a vertically held staff:
 

Staff Stations	P
Vertical angle	+8°36'

Staff intercept 2.350

Axial hair readings 2.105

The instrument is fitted with an anallactic lens and constant is 100. Find the difference in elevation between P and instrument axis. 10

- Q.7 a) Explain various elements of simple circular curve with the help of a neat sketch. 10
- b) A circular curve has a 200m radius and  $65^\circ$  deflection angle. Calculate (i) length of curve (ii) tangent length (iii) length of long chord. (iv) apex distance. 10

## End Semester Examination, May 2017

B. Tech.–Third Semester

### CONCRETE TECHNOLOGY(C-305A)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.

- Q.1
- a) What is fineness modulus?
  - b) Define 'creep'.
  - c) What do you understand by grade of concrete?
  - d) What are the pozzolans?
  - e) Mention name of four special types of concrete.
  - f) Define 'pumpable concrete'.
  - g) What is mean target compressive strength?
  - h) Mention IS code number for the 'guidelines' of mix design of concrete?
  - i) Define 'tensile strength of concrete'.
  - j) What is alkali-aggregate reaction? 2x10

#### PART-A

- Q.2
- a) Define 'concrete and its ingredients'. Mention any two ingredients which could be exceptional, with reason and its effect on strength. 8
  - b) Write down the properties of fresh concrete. Explain any one of them. 6
  - c) List different type of cement. Explain any two of them. 6
- Q.3
- a) What is specific gravity of aggregate? Brief its role in design of concrete mix. 5
  - b) Define 'soundness'. How does it affect concrete structure? 5
  - c) Classify the aggregate on basis of particle size, shape and surface texture. 5
  - d) Elaborate the test for initial and final setting of cement. 5
- Q.4
- a) Define 'workability'. What are the factors affecting workability of concrete. 5
  - b) What is slump value? Explain method of measurement of slump value. What is true slump, shear slump and collapse slump? 10
  - c) How permeability affects the durability and strength of concrete? 5

#### PART-B

- Q.5
- a) Define 'mineral admixture'. Explain their use and effects on concrete. 10
  - b) Does plasticizer and water reducing admixture are same? How does it affect the w/c ratio and strength of concrete? Explain the mechanism with example. 10
- Q.6
- a) Write short notes on:
    - i) Fibre reinforced concrete.
    - ii) Self compacting concrete. 5x2
  - b) Explain process of concreting under water. 10
- Q.7
- Design a mix proportion of M50 grade concrete, having max size of aggregate as 20mm, min and max cement content as 320kg/m<sup>3</sup> and 450kg/m<sup>3</sup> respectively. Workability of concrete as 100mm (slump). Type of aggregate used for concreting is crushed angular. Exposed condition to structure is severe method of concreting is pumping. Materials used for making concrete are coarse aggregate (G=2.74), fine aggregate (G=2.74) conforms to zone 1 and OPC 43 grade cement (G=3.15). 20

**End Semester Examination, May 2017**  
**B. Tech.– Third Semester**  
**STRENGTH OF MATERIALS (C-306-B / C-306-C)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- Differentiate between 'ductile' and 'brittle material'.
  - Differentiate between 'lateral strain' and 'longitudinal strain'.
  - What do you mean by 'principal stresses'?
  - Explain Mohr's circle.
  - Define 'neutral axis'.
  - What do you mean by 'flitched beam'?
  - Write the formula to calculate shear stress in a given section with usual notations.
  - Show the variation of shear stress in a T-section.
  - Define 'eccentricity'.
  - Write down the equation for polar moment of inertia for a solid shaft and a hollow shaft. 2 × 10

**PART-A**

- Q.2
- A rectangular block 300 mm x 250 mm x 100 mm is subjected to axial loads as follows: 40 kN tensile on 250 mm x 100 mm face, 500 kN compressive on 300 mm x 100 mm face and 400 kN tensile on 300 mm x 250 mm face. Assuming Poisson's ratio as 0.3 and E as  $2 \times 10^5 \text{ N/mm}^2$ . Find the change in volume, modulus of rigidity and bulk modulus of the material. 20
- Q.3
- The stresses at a point are  $\sigma_x = 70 \text{ MPa}$  (tensile),  $\sigma_y = 50 \text{ MPa}$  (tensile) and  $\tau_{xy} = 60 \text{ MPa}$ . Find the magnitudes of normal, tangential stresses and also find the principal planes. 20
- Q.4
- A 200 mm x 300 mm I-section has 10 mm thick flanges and web. Calculate the maximum bending stress developed if it acts as a simply supported beam of 4 m span with a UDL of 20 kN/m. 20

**PART-B**

- Q.5
- A rectangular beam 200 mm wide and 350 mm deep supports a UDL of 55 kN/m run over a simply supported span of 6 m. Determine the maximum shear stress and average shear stress. 20
- Q.6
- A short column of rectangular section 200 mm × 400 mm carries a compressive load of 700 kN. The load is applied at a point (50,50) considering the centroid of the section as the origin. Find the stresses at the four corners of the section. 20
- Q.7
- Write the assumptions made in deriving the equation of torsion. 5
  - A solid shaft is required to transmit 120 kW power at 180 rpm. Find the suitable diameter of the shaft if the allowable shear stress is 65 N/mm<sup>2</sup>. 15



**End Semester Examination, May 2017**  
**B. Tech.–Fourth Semester**  
**STRUCTURAL ANALYSIS II (C-401B)**

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer the following:

- What are the properties of analogous column?
- What are assumptions of slope deflection method?
- What are sign conventions used in moment distribution method?
- Calculate Static Indeterminacy:

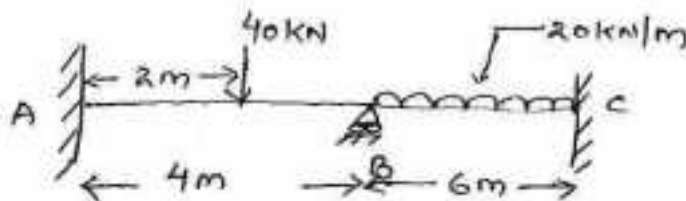


- Write the magnitude of bending moment at any point in cable.
- How does temperature affects horizontal thrust in two hinged arch?
- Define 'Betti's law'.
- State Maxwell's reciprocal theorem.
- Define 'carryover factor'.
- What is normal thrust and write the expression involved in it.

2x10

**PART-A**

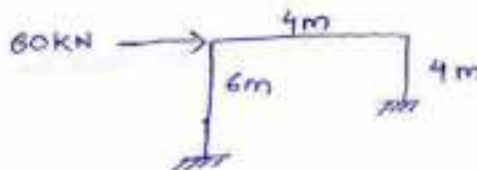
Q.2 Analyse the two span continuous beam shown in figure by slope deflection method and draw bending moment, shear force diagram and elastic curve. (Young modulus is same throughout).



Two span continuous beam.

20

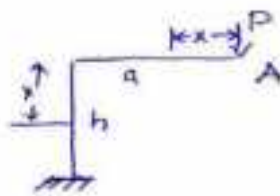
Q.3 Analyse the rigid frame by Moment Distribution Method. Sketch the Bending Moment Diagram.



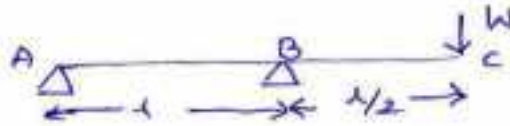
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Q.4 a) The bend ABC shown in figure carries a concentrated vertical load P at A. Find the vertical and horizontal deflections of A. Assume flexural rigidity.

12



- b) Find the vertical deflection of the load  $W$  for beam shown in figure.



8

### **PART-B**

- Q.5 a) Derive the expression for horizontal thrust in two hinged arch. 6  
 b) Show that the horizontal thrust developed in a parabolic arch of span  $L$  and rise  $h$  subjected to a concentrated load  $W$  at a distance ' $a$ ' from a springing is given by:

$$H = \left[ \frac{5}{8} \right] \left[ \frac{W}{hL^3} \right] a(L-a)(l^2 + la - a^2) \quad 14$$

- Q.6 A cord supported at its ends 40m apart carries loads of 20kN, 10kN and 12kN at distance 10 m, 20 m and 30 m from left end. If the point on the cord where the 10kN load is supported is 13 m below the level of end support. Determine reaction at the support:

- i) The tension in different parts of cord.
- ii) Total length of cord.

20

- Q.7 A fixed beam AB of Span 6m carries point loads 120kN and 90kN at distances 2 m and 4 m from the left end A. Determine the fixing moments at the ends. 20

# End Semester Examination, May 2017

## B. Tech.–FourthSemester SURVEYING II(C-403)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

Q.1 Answer in brief:

- a) Why do we apply coefficient of refraction?
- b) Define well-conditioned triangle.
- c) What does principle of least squares suggest?
- d) What do you understand by weight?
- e) How station adjustment is applied?
- f) What is active remote sensing?
- g) How principal point is found out?
- h) What is prime vertical?
- i) How do we define solstices?
- j) What is nodal point?

2x10

### PART-A

- Q.2 a) Determine the height of an object elevated above the ground when its base and top are visible but not accessible and baseline is horizontal and in line with the object. 10
- b) Determine the height of a pole above the ground on the basis of following angles of elevation from two instrument stations A and B in line with the pole. Angle of elevation from A to the top and bottom of pole is  $30^\circ$  and  $25^\circ$  respectively. Angles of elevation from B to the top and bottom of pole is  $35^\circ$  and  $29^\circ$  respectively. Horizontal distance AB = 30m. The readings obtained on staff at B.M. with two instrument settings are 1.48m and 1.32m respectively. What is the horizontal distance of pole from A? 10

- Q.3 a) The probable error of direction measurement is 1.25 seconds. Compute the maximum value of R if the maximum probable error desired is:  
i) 1 in 25,000      ii) 1 in 10,000. 10
- b) The altitude of two proposed stations A and B 130 km apart are 220m and 1160m respectively. The altitudes of two points C and D on the profiles between them are 308m and 632m respectively and the distances being AC = 50km and AD = 90km. Determine whether A and B are intervisible and if necessary, find the maximum (minimum) height of a scaffolding at B assuming A as the ground station. 10

- Q.4 a) Prove that the sum of the squares of residuals found by the use of arithmetic means is minimum. 10
- b) Form the normal equations for x, y and z in following equations of equal weight:  

$$3x + 3y + 2z - 4 = 0$$

$$x + 2y + 2z - 6 = 0$$

$$5x + y + 4z - 21 = 0$$
10

### PART-B

- Q.5**
- a) Define following terms:
    - i) Terrestrial poles and equator.
    - ii) Celestial poles and equator.
    - iii) Prime vertical.
    - iv) Co-declination.
    - v) The right ascension. **10**
  - b) Calculate the distance in kilometers between two points A and B along the parallel of latitude given that:
    - i) Latitude of A,  $28^{\circ}42'N$  ; Longitude of A,  $31^{\circ}12'W$   
 Latitude of B,  $28^{\circ}42'N$  ; Longitude of B,  $47^{\circ}24'W$
    - ii) Latitude of A,  $12^{\circ}36'S$  ; Longitude of A,  $115^{\circ}6'W$   
 Latitude of B,  $12^{\circ}36'S$  ; Longitude of B,  $150^{\circ}24'E$  **10**
- Q.6**
- a) A section appears in line AB to be 10.16 cm on a photograph for which the focal length is 16cm. The corresponding line measures 2.54cm on a map which is to a scale of  $\frac{1}{50,000}$ . The terrain has an average elevation of 200m above MSL. Calculate the flying altitude of the aircraft above MSL when photograph was taken. **10**
  - b) Write a short note on aerial camera and its components in 300 words with suitable figure. **10**
- Q.7**
- a) Explain the requirements of an idealized remote sensing system. **10**
  - b) Write in detail about space based platforms. **10**

**End Semester Examination, May 2017**  
**B. Tech.–Fourth Semester**  
**DESIGN OF CONCRETE STRUCTURE-I (C-404A)**

Time: 3 hrs.

Max Marks:100

No. of pages:2

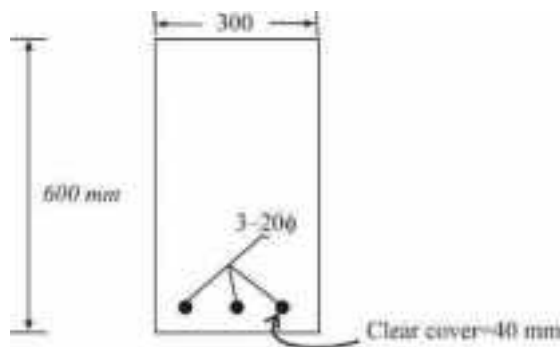
Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer the following question:

- a) Define 'characteristic strength of materials'.
- b) Mention the IS codes for different types of loading for obtaining characteristic loads.
- c) Differentiate between 'partial safety factor' and 'factor of safety'.
- d) Mention the minimum cement required in reinforced concrete exposed to mild condition.
- e) Explain doubly reinforced section.
- f) What are the factors affecting workability of concrete?
- g) Differentiate between 'tied column' and 'spiral column'.
- h) Explain one way slab.
- i) Why combined footing is required?
- j) Explain requirement of temperature and shrinkage steel in R.C.C. slab. 2 × 10

**PART-A**

- Q.2 a) Explain critical section, over-reinforced section and under-reinforced section in beam in working stress method and in limit state method of design. 10
- b) Find moment resistance capacity of the cross-section of beam shown in figure by working stress method of design. Assume M20 grade concrete and Fe415 grade steel.



10

- Q.3 Design detail a simply supported beam of clear span 6m subjected to uniformly distributed load of 30 kN/m inclusive of self-weight considering M25 grade concrete and Fe415 grade steel. 20

- Q.4 a) Explain diagonal tension failure. 3
- b) Write formula for development length. 3
- c) A reinforced concrete beam of rectangular section having a width of 300 mm and overall depth of 400 mm is reinforced with 4 of 20mm diameter distributed at each of the corners at an effective cover of 50mm in the direction of depth and side cover of 30 mm in the direction of width. 8mm diameter two legged stirrups are provided at 100mm centres. Estimate the torsional strength of the section adopting Fe415 grade steel and M20 grade concrete. 14

**PART-B**

- Q.5 a) Classify one way slab and two way slab. 5  
b) Design and detail a R.C.C. slab for a passage of size 2m × 8m subjected to an imposed load of 3 kN/m<sup>2</sup>. Slab is resting on 200 mm thick masonry wall. Consider M25 grade concrete and Fe500 grade steel. 15
- Q.6 Design a short circular column to carry an axial load of 1200 kN (Service) as:  
a) Tied column.  
b) Helically reinforced column.  
Use M30 grade concrete and Fe415 grade steel. 20
- Q.7 Design a square footing to carry a load of 500 kN (working) from a column of size 300mm × 300mm. Safe bearing capacity of soil is 120 kN/m<sup>2</sup> at a depth of 1.3m from general ground level. Assume M25 grade concrete and Fe415 grade steel. 20

**End Semester Examination, May 2017**  
**B. Tech.–Fourth / Sixth Semester**  
**DESIGN OF STEEL STRUCTURE-I (C-405A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

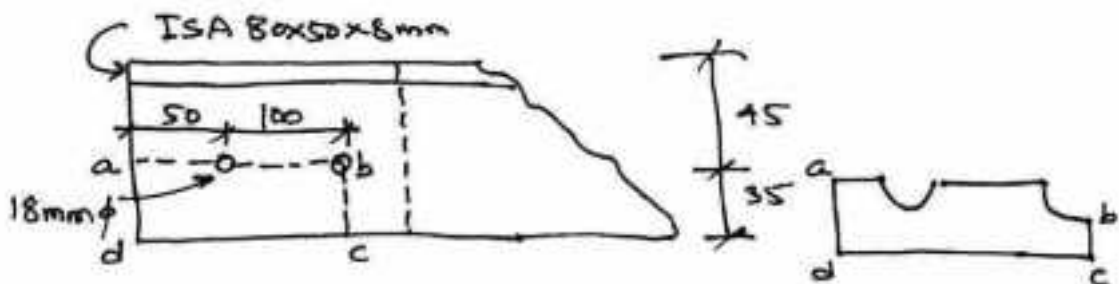
Q.1 Answer the following:

- a) What is residual stress?
- b) Name the code of practice for design load.
- c) Sketch sections for tension member.
- d) Explain effective length.
- e) What is the difference between spandrels and girt?
- f) What is the formula for bearing strength in web crippling?
- g) Draw typical form of foundation Bolts.
- h) Sketch welded plate girder.
- i) Sketch grillage foundation.
- j) What are the loads on gantry girder?

2 × 10

**PART-A**

- Q.2 a) Explain failure of riveted/bolted joint. 5  
 b) What are the advantages for bolted connections? 5  
 c) Calculate the strength of a 20 mm diameter bolt of grade 4.6 in lap joint. The main plate to be joined is 12mm thick. 10
- Q.3 a) What are the types of tension members? 5  
 b) Determine the block shear strength of the tension member shown below. The steel is of grade Fe 410.



15

- Q.4 a) Design a column to support an axial load of 1000 kN (Service) considering 4 m effective height. 15  
 b) Why we provide column base and caps? 5

**PART-B**

- Q.5 a) Explain the following terms: 5  
 i) Beam ii) Joists  
 iii) Girt iv) Lintel  
 v) Purlins  
 b) A simply supported steel joist of 4m effective span is laterally supported. It carries a load of 40 kN at mid span. Design an appropriate section using steel of grade Fe 410. 15





**End Semester Examination, May 2017**  
**B. Tech.– Fourth / Fifth/Sixth Semester**  
**SOIL MECHANICS (C-406)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- Name the method used to find liquid limit of soil.
  - What is shrinkage limit?
  - As per IS classification system what does 'SM' stands for?
  - Define maximum dry density and optimum moisture content.
  - List the factors influencing coefficient of permeability.
  - Write Laplace's equation.
  - Mention uses of flownets.
  - What do you mean by coefficient of volume change? Also write relation between coefficient of volume change and coefficient of compressibility.
  - Write two disadvantages of triaxial test.
  - If  $c = 42.5 \text{ kpa}$ ,  $\sigma = 600 \text{ kpa}$ ,  $\phi = 36.87^\circ$  what will be the shear strength of the soil.  $2 \times 10$

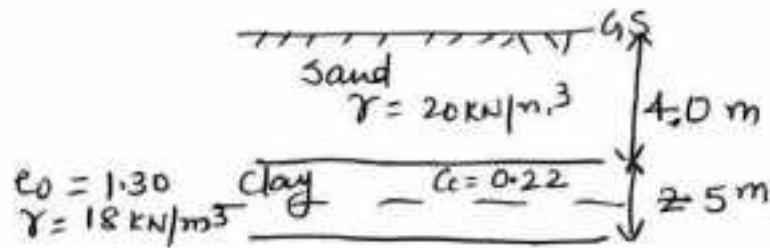
**PART-A**

- Q.2
- Calculate the void ratio, porosity and degree of saturation of a soil sample if it has a wet density of  $2.0 \text{ g/cc}$  and dry density of  $1.8 \text{ g/cc}$ . Take  $G = 2.7$ . 10
  - Explain Indian standard classification system of soil. Also discuss importance of soil classification. 10
- Q.3
- Give five examples of problems in soil engineering where a knowledge of permeability of soils is essential. 5
  - List the factors that influence permeability of soils and mention the manner in which they do so. 10
  - In a falling head permeability test on a sample  $12.2 \text{ cm}$  high and  $44.41 \text{ cm}^2$  in cross-sectional area, the water level in a stand pipe of  $6.25 \text{ mm}$  internal diameter dropped from a height of  $75 \text{ cm}$  to  $24.7 \text{ cm}$  in  $15 \text{ min}$ . Find the coefficient of permeability. 5
- Q.4
- State the assumptions implied in the use of the Boussinesq's theory to determine the vertical stress in a soil due to a point load & discuss their validity. 10
  - A concentrated load of  $40 \text{ kN}$  acts on the surface of a soil. Determine the vertical stress increment at points directly beneath the load upto a depth of  $10 \text{ m}$ . Plot the variation of vertical stress increment due to load on horizontal planes at  $2 \text{ m}$ ,  $3 \text{ m}$  upto a horizontal distance of  $3 \text{ m}$  on either side of centre. 10

**PART-B**

- Q.5
- Give an account of differences in soil characteristics such as structure, permeability, shear strength and swelling when it is compacted on dry and wet side of OMC. 10
  - What do you mean by field compaction of soil? Discuss suitability of compaction methods on different types of soils. 10
- Q.6
- Give a few causes of pre-consolidation in soils. 5
  - What do you understand by: immediate settlement, primary consolidation, secondary consolidation, normally consolidated clays, compression index? 5

- c) Calculate the final settlement of clay layer shown in fig below, due to an increase of pressure of  $30 \text{ kN/m}^2$  at mid height of the layer. Take  $\gamma_w = 10 \text{ kN/m}^3$ . Also calculate the settlement when W.T rises to the ground surface.



10

- Q.7 a) How do we define failure in soils? According to Mohr-coulomb criterion, how is the failure plane recognized and how is shear strength defined? 10
- b) Explain unconfined compressive strength test in detail.

**End Semester Examination, May 2017**  
**B. Tech.–Fourth Semester**  
**ENGINEERING GEOLOGY (C-407)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer the following:

- a) List objectives of engineering geology.
- b) What do you mean by 'fault'?
- c) Define 'streak of minerals'.
- d) What is epicenter and hypocenter?
- e) Mention the uses of dams.
- f) Differentiate between 'anticline' and 'syncline folds'.
- g) What do you mean by 'geological reports'?
- h) List optical properties of minerals.
- i) Give uses of remote sensing techniques for survey.
- j) What is time-scale?

2x10

**PART-A**

- Q.2 a) Define 'engineering geology'. Add a note on its importance and objective in civil engineering. 10
- b) Describe with the help of a neat sketch the various layers of interior of earth and discuss any two in detail. 10
- Q.3 a) What is earthquake? How is it measured? Explain different types of earthquake waves. 10
- b) Write short notes on:
- i) Sand dunes.
  - ii) Oxbow lakes.
  - iii) Richter scale.
  - iv) Soil profile.
  - v) Weathering.
- 10
- Q.4 a) Explain in detail physical properties of minerals with examples. 10
- b) Explain the characters, textures and structures of following rocks:
- i) Slate.
  - ii) Marble.
  - iii) Limestone.
  - iv) Granite.
  - v) Sandstone.
- 10

**PART-B**

- Q.5 a) Define a 'fold and its parts'. Explain the important types of folds as distinguished on the basis of inclination of axial plane with the help of neat sketches. 10
- b) Write a brief note on "faults in rocks, their causes and effects on engineering quality of rocks". 10
- Q.6 a) Explain various properties and functions of aquifer. 10
- b) Write a note on 'artificial recharge of ground water and its methods'. 10
- Q.7 a) Write about suitability of foundation sites for abutments. 10

**b) What are the geological problems after road construction? Explain in detail.**

**10**

**End Semester Examination, May 2017**  
**B. Tech.–FourthSemester**  
**FLUID MECHANICS(C-408A)**

Time: 3 hrs

Max Marks:100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer the following:

- a) Define 'total energy line'.
- b) Define 'mass density and weight density'.
- c) What is steady and unsteady flow?
- d) Define 'velocity potential function'.
- e) Define 'similitude'.
- f) Define 'flow net'.
- g) What is Newton's law of viscosity?
- h) What is critical velocity?
- i) What is the use of pitot-tube?
- j) What are hydraulic co-efficient?

2x10

**PART-A**

- Q.2
- a) Define 'surface tension'. Derive an expression for surface tension on a liquid droplet and a hollow bubble. 5
  - b) Explain in detail the classification of fluids. 5
  - c) A vertical gap of 2.2 cm wide of infinite extent contains a fluid of viscosity 2.0 Ns/m<sup>2</sup> and specific gravity 0.9. A metallic plate 1.1 m × 1.1 m × 0.2 cm is to be lifted up with a constant velocity of 0.15m/sec, through the gap. If the plate is in the middle of the gap, find the force required. The weight of the plate is 42N. 10
- Q.3
- a) State Pascal's Law. 3
  - b) A circular plate 3.0m diameter is immersed in water in such a way that its greatest and least depth below the free surface is 4 m and 1.5 m respectively. Determine the total pressure on one face of the plate position of the center of pressure. 7
  - c) A block of wood of specific gravity 0.7 floats in water. Determine the meta-centric height of the block if its size is 2 m x 1 m x 0.8 m. 10
- Q.4
- a) Define the equation of continuity. Obtain an expression for the continuity equation for a three – dimensional flow. 10
  - b) If for a two – dimensional potential flow, the velocity potential is given by:  

$$\phi = x(2y - 1)$$
Determine the velocity at the point (4, 5). Also determine the value of stream function at the point P. 10

**PART-B**

- Q.5
- a) Find the discharge of water flowing over rectangular notch of 3 m length when the constant head of water over the notch is 40 cm, take coefficient of discharge as 0.60. 3
  - b) Find the head loss due to friction in a pipe of diameter 300 mm and length 50m, through which water is flowing at a velocity of 3 m/s using Darcy's and Chezy's formula with C = 60. Take kinematic viscosity of water = 0.01 stokes. 7

- c) State and derive Bernoulli's equation for a steady flow and also state the assumptions. 10

Q.6 a) What do you mean by dimensionless numbers? Explain any four dimensionless numbers. 10

- b) Define the terms: laminar boundary layer, turbulent boundary layer, laminar sub-layer and boundary layer thickness with diagrams. 10

Q.7 a) What is pump? How will you classify a pump? Explain the function of any one type of pump in detail. 10

- b) Find the bed slope of trapezoidal channel of bed width 3 m, depth of water 2.5 m and the side slope of 2 horizontal to 3 vertical, when the discharge through the channel is  $10 \text{ m}^3/\text{s}$ . Take the value of  $n = 0.03$  in Manning's formula. 10

**End Semester Examination, May 2017**  
**B. Tech.— FifthSemester**  
**TRANSPORTATION ENGINEERING-I (C-501-A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q. 1 is compulsory. Attempt ANY TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- Why do we map study in engineering surveys?
  - Draw a neat sketch of star and grid pattern.
  - What is the need of providing transition curve?
  - Define the term LOS with a diagram.
  - Why widening of pavement is desired on horizontal curve?
  - What is off-tracking? Mention the factors on which it depends.
  - A vehicle travelling at 45 km/hr was stopped within 2.2 seconds after the application of brakes. Determine the average skid resistance developed.
  - Define the term basic capacity and possible capacity.
  - Define the term 'over-taking sight distance' and write down its formula.
  - What are the basic requirements of an ideal alignment? 2 × 10

**PART-A**

- Q.2
- Explain in detail the importance of transportation. 8
  - Determine the length of different categories of roads in a State in India by the year 2001, using the third road development formula and following data:  
 Total area of the state = 80,000 sq.km.  
 Total no. of towns as per 981 census = 75  
 Overall road density aimed at = 82 km per 100 sq.km area. 12
- Q.3
- Explain obligatory points with sketches. Also discuss how these obligatory points control the alignment. 10
  - What are the objectives of preliminary survey for alignments? Enumerate the details to be collected in conventional method of preliminary survey. 10
- Q.4
- The speeds of overtaking and overtaken vehicles are 65 and 40 km/hr. If the average acceleration is  $0.92 \text{ m/sec}^2$ , determine the overtaking sight distance and minimum length of overtaking zone. 10
  - Derive an expression for finding length of transition curve on horizontal alignment of highways. 10

**PART-B**

- Q.5
- How are FI and EI values determined in the laboratory? Discuss the importance of the test. 10
  - What are the different types of bitumen used in construction of pavement? Write down the difference between bitumen and tar. 10
- Q.6
- Calculate the stresses at interior, edge and corner region of cement concrete pavement using westergaard's stream equation and following data:  
 Wheel load,  $P = 4100 \text{ kg}$ .  
 Modulus of elasticity of cement concrete  $E = 3.3 \times 10^6 \text{ kg/cm}^2$   
 Poisson's ratio of subgrade,  $\mu = 0.15$   
 Modulus of subgrade reaction,  $k = 25 \text{ kg/cm}^2$   
 Radius of contact area,  $a = 12 \text{ cm}$   
 Pavement thickness,  $h = 18 \text{ cm}$  10
  - Differentiate between flexible and rigid pavement with diagrams. 10

- Q.7**
- a) Explain how spot speed studies are carried out. What are the various objects and applications of spot speed studies? Explain briefly. 10**
  - b) Classify the different types of traffic signs and mention the general objectives of each type of sign. 10**



**End Semester Examination, May 2017**  
**B. Tech.—Fifth Semester**  
**WATER SUPPLY AND TREATMENT PLANT (C-502)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Briefly answer:

- a) What is 'Infiltration Gallery'?
- b) Define available head of distribution system.
- c) What is residual chlorine?
- d) Write any two advantages of metering system.
- e) What is the meaning of 'population forecasting'?
- f) Name two types of aeration process.
- g) State two fittings of PVC pipes.
- h) Define 'fluoridation'.
- i) Define 'design period'.
- j) Name the all filter media used in multiple media filter.

2 × 10

**PART-A**

Q.2 a) Explain the importance of population forecasting for design of a water treatment plant. What are the methods followed for estimation of population forecasting? 10

b) A city has following recorded population:

1991	35000
2001	78000
2011	115000

Estimate by logistic curve method:

- i) Saturation population.
- ii) Expected population in 2021.

5 × 2

Q.3 a) Write short notes on:

- i) Physical impurities.
- ii) Colloidal impurities.
- iii) Hardness of water.
- iv) Jar test.

2½ × 4

b) Give the permissible limit of the following parameters in drinking water:

- i) Turbidity.
- ii) Iron.
- iii) Nitrates.
- iv) Fluorides.
- v) Arsenic.

1 × 5

c) Find out the pH of the mixture of the following two solutions:

Solution A: volume = 300 ml, pH = 4  
 Solution B: volume = 700 ml, pH = 8

5

Q.4 a) Explain the extra benefits of use of coagulant aids. Give few examples of coagulant aids. 5

b) Write short note on:

- i) Super chlorination.
- ii) De-chlorination.

2½ × 2

c) In a continuous flow settling tank 3m deep and 60m long, what flow velocity of water would you recommend for effective removal of 0.025mm particles at 25°C. The specific gravity of particles is

2.65 and kinematic viscosity  $\nu$  for water may be taken as  $0.01\text{cm}^2/\text{sec}$ .

5

### **PART-B**

- Q.5 a) Discuss the lime soda process with its merits and demerits. 10  
 b) At a water treatment plant, 16 million liters of water is treated daily, using alum dosage of 12 mg/liter. Find:  
 i) Total quantity of alum used daily.  
 ii) Amount of carbon dioxide released.  $5 \times 2$
- Q.6 a) Write short notes on:  
 i) Continuous water supply system with advantages and disadvantages.  
 ii) Intermittent water supply system with advantages and disadvantages.  $5 \times 2$   
 b) Design a clear water rising main line from water treatment plant to overhead tank for the following data:  
 Capacity of pump = 1 no @ 60000GPH.  
 Total length of pipe line = 250m.  
 Suction head of pump = 5m.  
 Static head of tank = 25m.  
 Ground level difference = 0.70m. 10
- Q.7 a) Explain the 'Dead End System' and 'Grid Iron System' with merits and demerits. 10  
 b) Design the capacity of service reservoir on the basis of following data:  
 Population = 60,000  
 Water supply demand = 160 lpcd  
 Peak factor = 2.5  
 Pumping hours = 12 hours (6 AM to 6 PM)  
 Assume demand pattern as follows:  
 i) 6-9AM, 1-2PM, 5-7PM ----- peak demand.  
 ii) 10AM-1PM, 2PM-4PM ----- 60% of average.  
 iii) 4AM-6AM, 4PM-5PM, 7PM-8PM ----- 70% of average.  
 iv) 8PM-4AM ----- assume low flow rate.  
 v) 9AM-10AM ----- 150% of average. 10

**End Semester Examination, May 2017**  
**B. Tech.—Fifth Semester**  
**IRRIGATION ENGINEERING-I (C-503B)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt Any TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Write short notes on:

- a) Gross command area.
- b) Paleo irrigation.
- c) Initial regime.
- d) Most economical sections.
- e) Difference between weir and barrage.
- f) Utility of canal escapes.
- g) Cross drainage works.
- h) Phreatic line.
- i) Equation for design of filters for earth dam.
- j) Name four types of spillways.

2 × 10

**PART-A**

- Q.2 a) Define Duty and Delta. Derive the relation between Duty and Delta. Also, list the factors affecting duty of a crop. 10 × 2
- b) Explain the different methods of irrigation with neat sketches. 10 × 2
- Q.3 a) List the advantages of lining a canal. 5
- b) What are outlets? What are the requirements of a good module? 5
- c) Design an alluvial channel with discharge 35 m<sup>3</sup>/sec and silt factor 1.1 10
- Q.4 a) What are canal falls? Describe five major types of falls with diagrams. 10
- b) What are silt excluders and silt extractors? Describe and differentiate in detail with the help of diagrams. 10

**PART-B**

- Q.5 a) Classify different cross drainage works along with their structures and relative levels. 10 × 2
- b) Describe different modes of failures of hydraulic structures on permeable foundations. Also, describe the corrective measures suggested by Bligh. 10 × 2
- Q.6 a) What are storage headworks? Describe the classification of dams with examples of each. 8
- b) An earth dam made of homogenous material has the following data:  
 Coefficient of permeability of dam material =  $5.5 \times 10^{-4}$  cm/sec.  
 Level of top of dam = 300 m  
 Level of deepest river bed = 280 m  
 H. F. L. of reservoir = 297.5 m  
 Width of top of dam = 4 m  
 Upstream slope = 3:1  
 Downstream slope = 2:1  
 Determine the phreatic line and the discharge passing through the dam if a horizontal filter of length 30m is provided inward from the downstream toe of the dam. 12

- Q.7 a) Define spillway and discuss the design considerations for a spillway. Also discuss the location of the 'main spillway' and 'subsidiary spillway' in dams. 8
- b) Design the profile of an Ogee spillway with the following data:
- $Q = 9000 \text{ m}^3/\text{s}$ .  
Number of spans = 8; Clear width between spans = 8 m  
Thickness of pier = 2.5 m  
Downstream slope = 0.7H : 1V  
Height of spillway crest = 204.0 m  
Average river bed at site = 100.0 m  
 $K_p = 0.01$ ,  $K_a = 0.1$  12

**End Semester Examination, May 2017**  
**B. Tech(Civil Engineering) – Sixth Semester**  
**BRIDGE ENGINEERING (C-504)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Answer the following questions:

- a) Scouring in river bed.
- b) How does the navigation requirement in a river effect the planning of a bridge?
- c) Give reason why earth pressure is considered in design of abutment but not in design of pier.
- d) Mention any five important forces acting on pier.
- e) Draw a neat sketch of skew culvert.
- f) Give reason why single column support is preferred in urban flyover or bridges.
- g) Mention three advantages of box girder steel bridge.
- h) What are the functions of pier? Describe it.
- i) List main requirement of stay cable in a cable stayed bridge.
- j) Describe the function of bearing in case of a bridge. 2×10

**PART-A**

- Q.2
  - a) A major bridge can be classified in many ways. Discuss them in detail. 10
  - b) Explain economical span of a bridge. 10
- Q.3
  - a) Seismic force is one of the most important forces to be considered in design of a bridge. Discuss it in detail. 10
  - b) What are different types IRC loading? Describe IRC class 70R loading with the help of neat sketch. 10
- Q.4
  - a) Find max B.M. for design of a continuous slab over a T-beam bridge with following details:
    - i) Clear roadway = 7.5 mtr.
    - ii) Number of T-beam = 3 spaced at 2.5 mtr. interval.
    - iii) Effective span of T-beams = 14.5 mtr.
    - iv) Number of cross beams = 5 at 3.625 mtr. interval.
    - v) Take  $m_1$  and  $m_2$  for B.M. calculation due to dead load as 0.47 and 0.0175 and  $m_1$  and  $m_2$  as imposed load B.M. calculation as  $7.75 \times 10^{-2}$  and  $2.675 \times 10^{-2}$ .
    - vi) Impact factor = 25%
    - vii) Line load to be considered = IRC class AA tracked vehicle. 12
  - b) Write a short note on hollow girder RCC bridge. 8

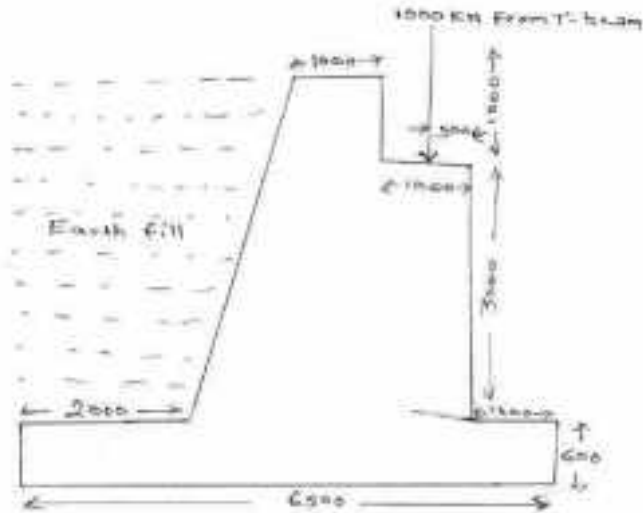
**PART-B**

- Q.5
  - a) Design a steel beam culvert with a clear span of 5mtr. to carry a broad gauge single track on main line. Dead load of track can be assumed as 10KN/mtr. 12
  - b) Discuss 'Cable stayed bridge' with neat sketch. 8
- Q.6
  - a) Sketch of aabutment is shown in the figure for a road bridge. Find the factor of safety against overturning and sliding considering following forces.
    - i) Self weight.

ii) Earth pressure.

iii) Load from deck slab.

Angle of friction of soil is  $30^\circ$ , coefficient of friction between RCC and soil is 0.5 and density of RCC and soil can be taken as 25 and 18 KN/m<sup>3</sup>.



(All dimensions are in mm)

12

b) Expansion joint is very important for success of a bridge. Describe type of it briefly. 8

Q.7

a) Write a detailed note on pile foundation and well foundation.

10

b) Explain necessary soil investigation required for selection of foundations for bridges.

10

Table 4.1 EUOL, CDA and Longitudinal Loads for Modified BG Loading-1987 and Modified MG Loading - 1988.

L m	CDA for Bending Moment and Shear	Modified BG Loading - 1987				Modified MG Loading - 1988			
		EUOL (Total) for B.M. kN	EUOL (Total) for Shear kN	Tractive Effort kN	Braking Force kN	EUOL (Total) for B.M. kN	EUOL (Total) for Shear kN	Tractive Effort kN	Braking Force kN
1	1.000	490	490	81	62	314	314	89	57
2	1.000	490	519	164	123	314	365	118	78
3	1.000	490	682	164	123	326	452	118	78
4	0.950	596	776	245	164	429	536	157	118
5	0.877	741	888	245	164	501	616	157	118
6	0.817	838	985	245	165	581	685	157	124
7	0.769	911	1068	327	221	644	755	176	135
8	0.721	981	1154	409	276	714	819	209	157
9	0.683	1040	1265	409	276	774	871	262	190
10	0.650	1101	1377	490	331	828	934	262	190
12	0.594	1377	1589	490	331	953	1061	314	235
15	0.531	1631	1801	490	368	1138	1252	353	253
20	0.458	1964	2168	735	496	1421	1532	471	353
25	0.408	2396	2586	735	565	1677	1833	523	401
30	0.372	2727	2997	981	662	1991	2144	628	480
40	0.324	3498	3815	981	816	2589	2748	828	594
50	0.293	4253	4630	981	975	3099	3269	828	702
60	0.271	5051	5442	981	1140	3625	3818	828	810
70	0.255	5831	6254	981	1301	4178	4372	828	916
80	0.243	6603	7065	981	1463	4727	4922	828	1020
90	0.233	7391	7876	981	1625	5274	5470	828	1134
100	0.225	8201	8686	981	1787	5822	6017	828	1242
110	0.219	9011	9490	981	1949	6365	6562	828	1349
120	0.213	9820	10300	981	2110	6908	7106	828	1457
130	0.209	10630	11115	981	2272	7451	7649	828	1565

Table 5.12 Basic Permissible Stresses in Steel.

Sl No.	Description	Permissible Stress
1.	Axial tension on net area	$0.60 f_y$
2.	Axial compression on effective section	$0.60 f_y$
3.	Flexure	
	In plates, flats and tubes	$0.66 f_y$
	In girders and rolled sections	$0.62 f_y$
4.	Shear	
	Maximum stress	$0.43 f_y$
	Average stress	
	For $f_y \leq 250$ MPa	$0.38 f_y$
	For $f_y > 250$ MPa	$0.35 f_y$
5.	Bending stress on flat surface	$0.80 f_y$

**End Semester Examination, May 2017**  
**B. Tech.– Fifth/ Sixth Semester**  
**DESIGN OF CONCRETE STRUCTURE-II (C-601A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Attempt all parts:

- a) Under what circumstances we provide pile foundation.
- b) Label different component of staircase with neat sketch.
- c) Draw B.M diagram for combined footing.
- d) Give two application of retaining wall.
- e) Mention code used for design of water tank.
- f) Give advantages of flat slab.
- g) What is the purpose of redistribution of bending moment in continuous beam?
- h) Draw a sketch of counterfort retaining wall.
- i) Define tendons.
- j) What do you mean by creep and shrinkage?

2 × 10

**PART-A**

- Q.2 Design a continuous beam of 3 spans each of 6m length. The characteristic load is 12 kN/m (dead) and 14 kN/m (live). Design the critical section of beam using M20, Fe 415. Use limit state method. 20
- Q.3 a) Design an interior panel (only middle strip) of a flat slab for a live load of 4000 N/m<sup>2</sup>. The slab is provided with a floor finish weighing 1000 N/m<sup>2</sup>. The panels are 6m × 6m. Drops shall be provided. Use M20 concrete and Fe415 steel. 15
- b) Write a short note on classification of stairs. 5
- Q.4 Design a combined footing for two columns A and B of size 300 mm x 300 mm each subjected to a load of 500 kN and 600 kN respectively. Column A is situated on property line. Consider safe bearing capacity of soil as 160 kN/m<sup>2</sup> at a depth of 1.4 m from general ground level. Assume M30 grade concrete and Fe415 grade steel. 20

**PART-B**

- Q.5 a) Design a circular water tank resting on a firm ground to the following particulars  
 Diameter of tank = 3.50 m  
 Depth of water = 4m  
 The wall and base slab are not monolithic with each other  
 Specific wt. of water = 10 kN/m<sup>3</sup>  
 Use M25 concrete and Fe 415 steel 15
- b) Explain joints in tank with sketch. 5
- Q.6 a) What is pre-stressed concrete? 3
- b) Describe load balancing concept. 7
- c) A pre-stressed concrete rectangular beam of size 150 mm x 300 mm support udl of 12 kN/m (inclusive self-weight) over span of 6m. Beam is pre-stressed with an eccentricity of 100 mm. Find the pre-stressing force required for zero tension in concrete. 10
- Q.7 Explain the following:
- a) Rigid frame and braced frame. 6
- b) Write assumptions in analysis of rigid frame subjected to horizontal loads by a portal frame method. 4

- c) Sketch ductile detailing for beam column and foundation for a R.C.C. frame as per IS: 13920. 10



**End Semester Examination, May 2017**  
**B. Tech– Sixth Semester**  
**DESIGN OF STEEL STRUCTURE-II (C-602)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.

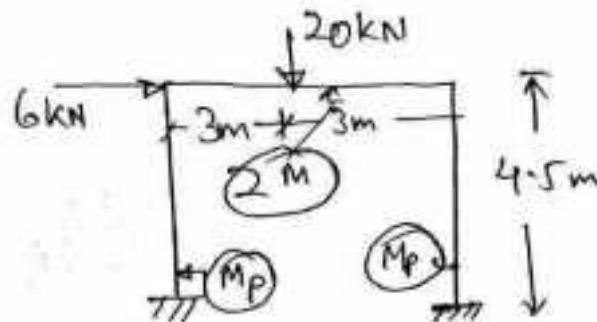
Q.1 Write short notes on:

- a) Static theorems or lower bound theorem of plastic analysis.
- b) Shapes factor of rectangular section.
- c) Classification of industrial building.
- d) Stays in pressed steel tank.
- e) Forces on a stack.
- f) Define guyed steel stack.
- g) XBX bracing lattice tower.
- h) W bracing lattice tower.
- i) Post buckling strength of plate.
- j) Compressive stress distribution and effective width.

2 × 10

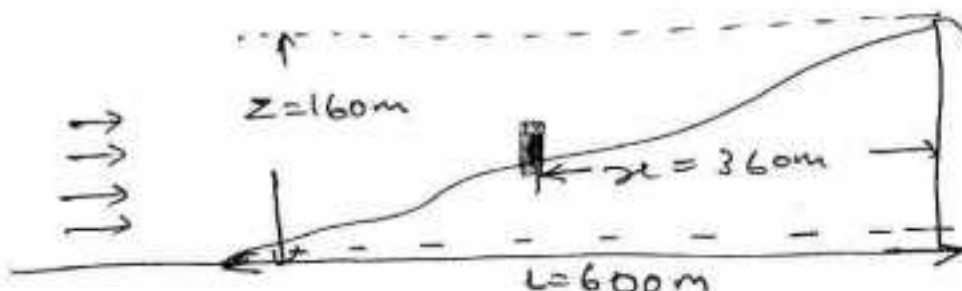
**PART-A**

Q.2 Find the value of  $M_p$  for the portal and loaded upto collapse, as shown in figure.



20

Q.3 An industrial building is to be built in Delhi near a hill 150 m high with a slope of 1 vertical to four horizontal. The building is to be constructed at a height of 60 m above the base of the hill. The size of the structure is in the range from 20 m to 50 m. The terrain is an open terrain in which the surrounding features are of height less than 1.5 m above ground level. The height of the building is 15 m. Find the design wind pressure. Assume that the life period of the building is 50 years.



20

- Q.4 An elevated rectangular steel water tank open at top is required to have a capacity of 98000 liters with a free board of not less than 200 mm. The bottom of tank is at 10 m above ground level. Using 1.25 m × 1.25 m standard pressed steel plates and suitable allowable stress, design the following:
- Design the size of the tank and arrangement of the pressed steel plates. Show the sketch of the tank.
  - Design upper and lower stays.

20

### PART-B

- Q.5 Design chimney shell at 10 meter from top of a welding self-supporting steel stack located in the outskirts of Guwahati for the following data:

Terrain category	2
Topography	Almost flat
Height of steel stacks	90 m
Diameter of steel stacks	3 m
Thickness of brick lining	100 mm
Corrosion allowance	3 m

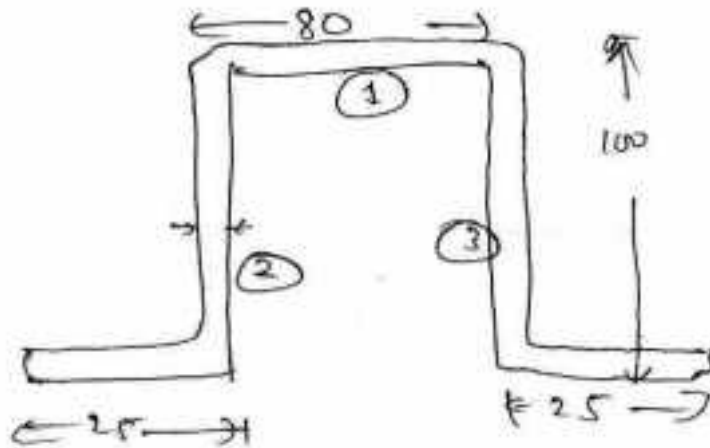
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- Q.6 a) Explain the following with a neat sketch:
- Self-supporting towers.
  - Guyed towers.
- b) Discuss lattice tower configuration and bracing with a neat sketch. Write down maximum height of each type of lattice tower used in self-supporting towers.

5 × 2

10

- Q.7 A hat of 100 mm × 80 mm × 4 mm section with a 25 mm lip as shown in figure is to be used as a concentrically loaded column of 3.1 m effective length. Determine the allowable load take  $f_y = 250 \text{ N/mm}^2$ .



20

**End Semester Examination, May 2017**  
**B. Tech– Sixth Semester**  
**DESIGN OF STEEL STRUCTURE-II (C-602)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Write short notes on:

- a) Static theorems or lower bound theorem.
- b) Shape factor of rectangular section.
- c) Classification of industrial building.
- d) Stays in pressed steel tank.
- e) Forces on a stack.
- f) Define guyed steel stack.
- g) XBX bracing lattice tower.
- h) W bracing lattice tower.
- i) Post buckling strength of plate.
- j) Compressive stress distribution and effective width.

2 × 10

**PART-A**

Q.2 Find the value of MP for the portal and loaded upto collapse, as shown in figure.

**FIGURE**

20

Q.3 An industrial building is to be built in Delhi near a hill 150 m high with a slope of 1 vertical to four horizontal. The building is to be provided at a height of 60 m above the base of the hill. The size of the structure is in the range from 20 m. to 50 m. The terrain is an open terrain in which the surrounding features are of height less than 105 m. above ground level. The height of the building is 15 m. find the design wind pressure. Assume that the life period of the building is 50 years.

**FIGURE**

20

Q.4 An elevated rectangular steel water tank open at top is required to have a capacity of 98000 liters with a free board of not less than 200 mm. The bottom of tank is at 10 m above ground level. Using 1.25 m × 1.25 m standard pressed steel plates and suitable allowable stress, Design the following:

- i) Design the size of the tank and arrangement of the pressed steel plates. Show the Sketch of the tank.
- ii) Design upper and lower stays.
- iii) Design longitudinal and cross sectional beam.

20

**PART-B**

Q.5 Design a welding self-supporting steel stack located in the outskirts of Guwahati for the following data:

Terrain category	2.
Topography	Almost flat.
H+ of steel stacks	90 m.
Diameter of steel stacks	3 m.
Thickness of brick lining	100 mm.

Corrosion allowance                      3 m.                      20

Q.6 a) Explain the following with neat sketch:

i) Self-supporting towers.

ii) Guyed towers.

5 × 2

b) Discuss lattice tower configuration and bracing with neat sketch. Write down maximum height of each type of lattice tower used in self-supporting towers. 10

Q.7 A hat of 100 mm. × 80 mm. × 4 mm. sections with a 25 mm lip as shown in figure is to be used as a concentrically loaded column of 3.1 m. effective length. Determine the allowable load take  $f_y = 235 \text{ N/mm}^2$ .

FIGURE

20

**End Semester Examination, May 2017**  
**B. Tech.—Sixth Semester**  
**IRRIGATION ENGINEERING-II (C-603A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Write short notes on:

- a) Necessity of weirs.
- b) Safe exit gradient.
- c) Guide banks and its utility.
- d) Super passage and syphon.
- e) Energy dissipation devices.
- f) Spillways and its utility.
- g) Middle-third rule.
- h) Types of canal falls.
- i) Merits of gravity dam.
- j) Forces acting on gravity dams.

2 × 10

**PART-A**

- Q.2 a) Describe Bligh's creep theory with the corrections given against failure of hydraulic structures made on permeable foundations.  
 b) Describe Khosla's theory in detail. Also explain the procedure to calculate the exit gradient. 10 × 2

- Q.3 a) What do you understand by meandering? What are its causes? 5  
 b) Design a guide bank required for a bridge on a river having the following particulars:  
 Design flood discharge = 50000 cumecs.  
 Silt factor = 1.1  
 Bed level of river = 130 m.  
 High flood level = 140 m. 15

- Q.4 a) Write a note on selection of suitable type of cross-drainage works. 8  
 b) Explain the design principles for design of a syphon aqueduct in brief. 12

**PART-B**

- Q.5 a) Design the profile of an Ogee spillway with the following data:  
 Q = 8000 cumecs.  
 L = 60 m.  
 $K_p = 0.01$   
 $K_a = 0.1$   
 No. of spans = 6  
 Downstream slope = 0.7:1  
 Average bed level = 200 m.  
 Height of spillway crest = 305 m. 12  
 b) Enumerate the different types of spillways and draw neat sketches showing different components. 8
- Q.6 a) What are sloping glacis falls? Explain the manner of energy dissipation in sloping glacis falls.  
 b) Explain the procedure of designing Sarda type fall along with a neat sketch. 10 × 2

- Q.7 a) Design the practical profile of a gravity dam of stone masonry, given the following data:

R.L. of base of dam = 1450 m.

R.L. of F.R.L. = 1480.5 m.

Specific gravity of masonry = 2.4

Safe compressive stress for masonry =  $1200 \text{ KN/m}^2$ .

Height of waves = 1 m.

12

- b) What do you mean by gravity dam? Explain how do you account for earthquake effects in the design of a gravity dam.

8

**End Semester Examination, May 2017**  
**B. Tech– Sixth Semester**  
**TRANSPORTATION ENGINEERING-II (C-604A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) Explain the function of prime coat and tack coat in bituminous pavement.
  - b) Explain the term WBM and WMM in brief.
  - c) List the different types of damages of road during and after rainy season.
  - d) What are PSI and PSR?
  - e) Explain the term resisting length with diagram.
  - f) Differentiate between 'surface' and 'sub-surface' drainage system.
  - g) Define various types of sleepers used on Indian railways.
  - h) What are the possible causes of creep? What are the effects of creep?
  - i) Enumerate the disadvantages of air transport.
  - j) Explain the various types of tunnels in brief. 2 × 10

**PART-A**

- Q.2
- a) Discuss the advantages, applications and limitations of compacting equipment's used in construction of embankments. 10
  - b) Specify the materials and steps required for construction of pre-mix carpet roads. What are the uses and limitation of this type of road? 10
- Q.3
- a) Write brief notes on the following types of distresses in bituminous pavements:
    - i) Raveling.
    - ii) Rutting.
    - iii) Corrugations.
    - iv) Edge breaking.
    - v) Reflection cracking.
    - vi) Alligator cracks. 2 × 6
  - b) Explain the importance of highway maintenance on regular intervals. 8
- Q.4
- a) The maximum quantity of water expected in one of the open longitudinal drains on clayey soil is  $1.4\text{m}^3/\text{sec}$ . Design the cross section and longitudinal slope of trapezoidal drain assuming the bottom width of the trapezoidal section to be 0.75m and cross slope to be 1.0 vertical to 1.5 horizontal. The allowable velocity of flow in the drain is  $0.8\text{m}/\text{sec}$ . and manning's roughness coefficient is 0.02. 12
  - b) Explain with sketches how the surface drainage system is provided to lower the water table in permeable soil and impermeable soil. 8

**PART-B**

- Q.5
- a) Illustrate the various types of rail failures with sketches. 10
  - b) Briefly describe the various types of sleepers with its advantages and sleeper density. 10
- Q.6
- a) The length of runway under standard condition is 1600m. The airport site is at elevation of 275m. The reference temperature is  $32.4^\circ\text{C}$ . If the runway is constructed with an effective gradient of  $0.20x$ , calculate corrected length of runway. 10
  - b) What are the airport obstructions considered for the safe air navigation? Explain. 10
- Q.7
- a) Explain full-face method of tunneling with diagram. 10

- b) What is the necessity of tunnels? Also explain the advantages and disadvantages of tunnels.

10



**End Semester Examination, May 2017**  
**B. Tech.–Sixth Semester**  
**ENVIRONMENTAL ENGINEERING (C-605)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Briefly answer:

- a) Define 'self-cleansing velocity of sewer'.
- b) Write one function of catch basin.
- c) Define 'ambient monitoring'.
- d) What is stack monitoring?
- e) Distinguish between sewers and sewerage.
- f) Write the relation between  $BOD_5$  and  $BOD_U$
- g) What are Biodegradable wastes? Give example.
- h) Write the BOD and Bacteria removal %age in PST.
- i) Explain point sources of water pollution.
- j) Define function of screen in STP.

2 × 10

**PART-A**

Q.2 a) Discuss with example major effects of air pollution in environment. 10

b) Average pressure of the day at station level = 712.59 mm of Hg

Average Temperature = 30.60°C

Actual sampling time = 24 hrs.

Sampling rate: Clean after = 1.6 cum/min and filter after exposure = 1.5 cum/min

Weight of filter before exposure = 3.417 gm

Weight of filter after exposure = 3.925 gm

Determine suspended particulates concentrates.

10

Q.3 a) Define 'solid wastes' with examples. Explain outline of solid waste managementsystem with diagram. 10

b) Estimate the

i) Overall moisture content,

ii) Average energy content,

iii) Unit energy content (on dry basis),

iv) Unit energy content (on ash free dry basis) from the following given data for a sample weighing 100 kg. The sample was found to be having an ash content of 6%.

Component	% by Mass	Moisture Content (%)	Energy Content (KJ/kg)
Food waste	25	70	4650
Paper	35	7	16750
Cardboard	8	5	16300
Plastic	10	2	32600
Yard waste	10	65	6500
Wood	8	25	18600
Tin Can	4	2	700

10

- Q.4 a) Explain how a newly constructed sewer line can be tested? 10  
 b) A small town with a projected population of 30000 residing over an area of 16 hectares is provided with a water supply @ 150 *lpcd*. Find the design discharge for a combined sewage. Assume run-off coefficient = 0.4 and time of concentration = 15 minutes. Make suitable assumption where needed. 10

**PART-B**

- Q.5 a) Explain the significant of 1st stage BOD and 2nd stage BOD. 5  
 b) Explain sources and problems of grease and oils in sewage. 5  
 c) A city with population of 100,000 and a sewage flow 200 *lpcd* is located on a stream with a rate of flow of 0.8 m<sup>3</sup>/sec. The BOD of sewage is 180 mg/l. The DO and BOD content of stream above the outfall of sewer are 7.5 and 1mg/liter respectively.  
 i) How many kg of oxygen per day are available above the outfall?  
 ii) What is the total kg of BOD per day in the stream just below the outfall?  
 Assuming no oxidation takes place.  
 iii) Express the total BOD in mg/liter. 10
- Q.6 a) Explain the function and importance of skimming tank in biological treatment process with diagram. 10  
 b) A grit chamber with a proportionate flow weir at its outlet to be designed to handle a sewage flow from a population of 50000 and a per capita daily consumption of water of 135 litres. Design the grit chamber. 10
- Q.7 a) Explain the self-purification process of river with diagram. 10  
 b) Write short notes on:  
 i) Diffused sources of water pollution.  
 ii) Coagulation of polluted water. 5×2

**End Semester Examination, May 2017**  
**B. Tech– Sixth Semester**  
**PRACTICAL ASPECTS OF PROJECT MANAGEMENT (C-705)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 5

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Define and explain in brief:

- a) CPM.
- b) IRR.
- c) Bill of material.
- d) Updating of PERT.
- e) Gantt chart.
- f) Purchase order.
- g) Measurement book.
- h) MOM
- i) Daily site report.
- j) Monthly project report.

2 × 10

**PART-A**

Q.2 a) Mohan and Sohan started their own ventures at the same time. Mohan invested ₹ 50 lakhs and Sohan ₹ 70 lakhs. Calculate their income over next 5 years.

- i) NPV of Mohan (Discounting rate @ 18% p.a.)
- ii) NPV of Sohan. (Discounting rate @ 20% p.a.)

Assume any data suitably.

10

- b) Explain the term quality with respect to work and material. Discuss with examples. 5
- c) Differentiate between Bar chart and PERT. Cite examples to support your points. 5

Q.3 A project consists of 12 activities. Their time estimates are given below. Draw time scale network:

- a) Mark critical path.
- b) What is the project duration?

Activity	Items	Time (in week)
0-1	A-1	6
0-3	B-1	4
0-6	D-1	2
1-2	A-2	4
3-4	B-2	3
6-7	D-2	3
3-7	C	3
7-5	Dummy	0
2-5	A-3	1
4-5	E-1	4
5-8	E-2	3
7-8	D-3	8

20

- Q.4 a) Draw a bill of quantity for manufacturing 100 cum of M 20 concrete to be placed in position of a roof slab. Also draw the table for quantity of materials required to manufacture concrete. 12
- b) If the rate of cement is ₹400/- per bag of 50 kg. What is the total expenditure expected. Assume rates of other material required suitable and mention the same. 8

**PART-B**

- Q.5 Define and explain:
- a) Time value of money.
  - b) Compound annual growth rate (CAGR).
  - c) Payback period.
  - d) Internal rate of return.
  - e) Balance sheet.
  - f) Cash flow statement.
  - g) NPV.
  - h) Discounting.
  - i) P&L account.
  - j) WBS. 2 × 10
- Q.6 a) What are the challenges real estate sectors is facing in India? Discuss the challenges and suggest ways to meet them. 10
- b) What is the difference between fixed cost and variable cost? Give examples. 5
- c) Define and explain:
- i) Estimated cost. 1½
  - ii) Cost to completion. 1½
  - iii) Final cost. 2
- Q.7 a) What is site kick-off? How will you ensure timely completion of a project? 5
- b) What do you understand by check list? Draw a check-list for concreting work in a building project. 10
- c) What are the documents to be completed and archived in a real estate project? Support your answer with examples. 5

**End Semester Examination, May 2017**  
**B.Sc. (Interior Design)-Sixth Semester**  
**PRACTICAL ASPECTS OF PROJECT MANAGEMENT(C-705)**

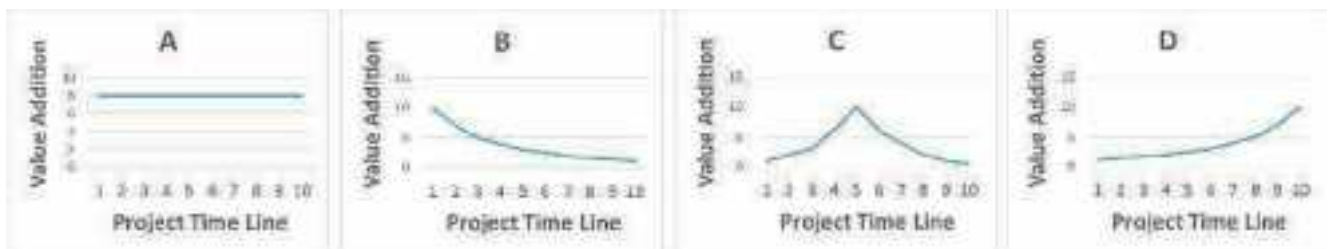
Time: 3 hrs

Max Marks: 100

No. of pages: 5

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.

- Q.1 a) Write full form for:
- BOQ
  - RERA
- b) What are the 3 primary objectives of project management?
- c) What is meant by "Big Picture"? Explain giving example.
- d) What is "Feedback" and why is it useful?
- e) What are Gantt Chart and Network Diagram? Explain the difference.
- f) What is meant by "Front Loading" in an item rates tender? Explain giving an example.
- g) Is it a good policy to put purchase and stores under the same person? Give reasons.
- h) Prepare project organogram for a project site showing at least 5 positions.
- i) Which of the graphs below signifies the scope for value addition against the timeline of a project? A, B, C or D?



- j) What is meant by compounding and discounting? Explain the difference. 2x10

**PART-A**

- Q.2 a) Two friends-Ajay and Vijay start their own ventures at the same time. Ajay invests Rs. 80/- lakh and Vijay invests Rs. 60/- lakh. Their income over the next 4 years is as shown in the attached sheet:
- Compute all the shaded cells in the Table.
  - What is the NPV of Ajay (take discounting rate @ 20% pa)?
  - What is the NPV of Vijay (take discounting rate @ 18% pa)?
  - What is the NPV of Vijay (take discounting rate @ 20% pa)?
  - Which out of the following could be the IRR on Vijay's investment: 17%, 18%, 19%, 20% or 21%? Support your answer with logic. 2x5
- b) A project has 4 towers to be built. Each tower has an area of 20,000 sft and the construction cost is estimated @ Rs. 2,500 / sft. Because of a recession in market, contract is awarded only for 2 towers. The contract value is Rs. 11 Crore-higher than estimates because some prices were incorrectly assumed. It is expected that order for the 3rd and 4th towers will be released after one year at 8% higher rates (due to inflation)
- What is the initial estimated cost of project? 3
  - What is the committed cost? 3

iii) What is the expected cost to completion? 4

- Q.3 a) See the project network in the attached sheet, in which durations are mentioned:
- i) Fill in the early start, early finish, late start and late finish of all activities and milestones. 6
  - ii) Which is the critical path? 2
  - iii) What is the project duration? 2
- b) The contractor has submitted the measurement sheet for his RA bill as given in attached sheet. Compute the qty and prepare the RA bill. 10
- Q.4 a) The item of works in a civil contract are as given in attached sheet. The material rates and their consumption norms for each item of works are also given. Fill all shaded cells.
- i) Find out the quantity consumed for each material. 2
  - ii) Find out the value consumed for each material and the total value of materials consumed for the project. 3
  - iii) Fill the consumption quantity and value in table "Material Rates and Qty." 2
  - iv) Find the Cost of Each Item of Works and Cost/Unit. What is the total cost of all Items of work? 3
- b) For a project, team A prepared a plan based upon 5 days working in a week [Monday to Friday]. Team B prepared their plan on 6 days a week [Monday to Saturday, with Christmas Eve (24 December) and on New Year (2 January) as holidays]. What is their End Date? 10

### **PART-B**

- Q.5 a) What is Work Breakdown Structure? Explain giving example from Architecture /Interior Design showing at least 3 levels of WBS. 5
- b) What is a Pour Card? Where is it used? Why is it important? Explain. 5
- c) What is Quality of Materials/Quality of Works? Explain giving two examples of each. 5
- d) Write an e-mail in 100 words explaining a site accident to your manager. 5
- Q.6 a) Write a note on the Real Estate Sector. Which are the Drivers of Real Estate Sector? Who are the Stakeholders? What are the Key Challenges? 5
- b) In a Project Network, what are Dangling Nodes? Are Dangling Nodes allowed in Projects? Explain, with a sketch. 5
- c) What is a Logic Note and what is its importance. Explain giving Example. 5
- d) Why is Calibration of Cube Testing Machine important? 5
- Q.7 a) Explain, giving one common example, all stages of Cost Management:
- i) Cost Plan
  - ii) Cost Estimate.
  - iii) Committed Cost.
  - iv) Cost to Completion.
  - v) Final Cost. 5
- b) What are Checklists? What is their importance in Project Management? Select anyone process and develop a checklist for the same. 5
- c) Why is it important for the Architect to visit the project site? Explain, giving reasons. List down at least 4 stages when the architect should visit the site, explaining the importance of each visit. 5
- d) Why is project close-out important? Illustrate at least 3 of its contents. 5

## End Semester Examination, May 2017

B. Tech.–Seventh Semester

### ESTIMATING AND COSTING(C-801A)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write short notes on the following:

- a) Lump sum contract.
- b) Security money.
- c) Capital cost.
- d) Sinking fund.
- e) Span tender.
- f) Cash book.
- g) Write the names of two methods of estimating.
- h) Differentiate between 'approximate estimate' and 'detailed estimate'.
- i) Write general specifications of sand.
- j) What are the factors on which rates of materials depends?

2x10

#### PART-A

Q.2 a) Prepare an estimate for the portion of a road from chainage 6 to 10 from the data below:

Chainage	6	7	8	9	10
R.L. of ground	108.6	109.3	109.4	108.9	108.5
Formation level	111				

Length of chainage is 30m. The rate of earthwork in cutting is Rs 8/- per cum and in filling is Rs.7/- per cum. The formation width of proposed road is 10 m. Side slope is 2:1 (H: V) and longitudinal slope of road is 1:100 downward throughout the length. Estimate is to be prepared for earth work only.

10

b) What is the purpose of estimation? Describe any two types of estimates in detail. 10

Q.3 a) Write down detailed specification of brickwork in 1<sup>st</sup> class building.

10

b) Write general specifications of any-three:

- i) Cement mortar 1:6
- ii) White washing
- iii) DPC
- iv) Earthwork in foundation.

10

Q.4 a) Describe rate analysis of cement concrete (1:2:4) in foundation per m<sup>3</sup>. Assume rates of different parameters required.

8

b) What are the factors on which rate of an item depends?

6

c) Calculate no. of bricks required in 10m<sup>3</sup> of brick work and also calculate the quantities of mortar required.

6

#### PART-B

Q.5 a) Write an NIT for a school building to be constructed by a private builder at a cost of Rs 100 crores and is to be completed in 2 years' time.

10

b) Explain the difference between 'technical sanction' and 'administrative approvals' in detail.

10

- Q.6 a) What is 'Measurement Book'? Write down the precautions to be taken while filling up the measurement book. 10
- b) Define a contract and explain any three types of contracts in details. 10
- Q.7 a) An old machinery has been purchased by a person at a cost of Rs. 50,000/-. Calculate the amount of annual sinking fund at 7% interest rate assuming further life of machinery as 15 years and scrap value of building at 10% of the cost of purchase. 10
- b) Explain the purpose of valuation of building and its importance in detail. 10



**End Semester Examination, May 2017**  
**B. Tech.–Eighth Semester**  
**TENDERING AND VALUATION(C-802)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Define the following:

- a) What is corrigendum?
- b) Tender drawing.
- c) Wager contract.
- d) Mitigation of penalty.
- e) Comparative statement.
- f) Work of evaluation panel.
- g) Re–invitation of tenders.
- h) Lump sum contracts.
- i) Two bid system of tender submission.
- j) Domestic arbitration.

2x10

**PART-A**

- Q.2 a) Explain in details the tender submission and evaluation process and draw a flow chart for the same. 10
- b) What do you mean by security money? Explain the process of refund of EMD? 10
- Q.3 a) Write the specification for burnt brick masonry in cement mortar. 10
- b) Explain the following terms:
- i) Tender validity period.
  - ii) Eligibility for a tender.
  - iii) Project risk.
  - iv) Negotiation. 10
- Q.4 a) What are the different processes of tendering? What do you understand by the selection panel and responsibility of selection panel? 10
- b) Write short notes on:
- i) Contract award.
  - ii) Negotiation.
  - iii) Notification.
  - iv) Earnest money. 10

**PART-B**

- Q.5 a) Define the following:
- i) Agreement ii) Offer iii) Contract iv) Promise. 10
- b) What are the different types of contracts? Explain any two in detail. 10
- Q.6 a) Explain the following terms:
- i) Arbitrator ii) Delection criteria of an arbitrator
  - iii) Pre hearing conference iv) Joint exhibits. 10
- b) What is the arbitration? What are the factors for starting arbitration proceedings? 10
- Q.7 a) Write a note on “administrative approval and technical sanction”. 10

**b) Explain the importance of detailed specifications in tender filling process.**

**10**

**End Semester Examination, May 2017**  
**B. Tech.–Seventh/ Eighth Semester**  
**HYDROLOGY(C-803)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.

- Q.1 a) Define 'hydrological cycle'.  
 b) State Darcy's law.  
 c) Define 'specific retention'.  
 d) What do you mean by interception losses?  
 e) What is hydrograph?  
 f) What do you mean by  $\Phi$  – index?  
 g) Define the term: 'infiltration capacity'.  
 h) List out the various forms of precipitation.  
 i) Define 'potential evapotranspiration'.  
 j) Name any three factors that affect evaporation losses in a reservoir. 2x10

**PART-A**

- Q.2 a) Describe in detail the various ways of presenting the rainfall data. 10  
 b) Recording of rain is very important aspect in study of hydrology. Describe any two non-recording type rain gauges with help of a neat sketch. 10
- Q.3 a) What do you mean by the term evapotranspiration? Explain the method of measuring evapotranspiration. 10  
 b) A reservoir with a surface area of 250 hectares had the following average values of parameters during a week: Water temperature=20°C, relative humidity=40%, wind velocity at 1.0m above the ground=16km/h. Estimate the average daily evaporation from the lake and the volume of water evaporated from the lake during that one week. 10
- Q.4 a) Explain briefly the infiltration process and how the measurement of infiltration takes place. 10  
 b) A 12-hour storm rainfall with the following depth in cm occurred over a basin; 2.0, 2.5, 7.5, 3.7, 10.4, 4.8, 7.2, 10.0, 6.0, 4.0, 1.5 and 1.5. The surface runoff resulting from the above storm is equivalent to 25.5 cm of depth over the basin. Determine the average infiltration index ( $\Phi$  – index) for the basin. 10

**PART-B**

- Q.5 a) What do you mean by runoff? What are the various factors that affect runoff? Explain in details. 10  
 b) Explain methods of the measurement of velocity flow in a stream. 10
- Q.6 a) What are the assumptions made in derivation of unit hydrograph (UH)? How the unit hydrograph is derived from a simple flood hydrograph of isolated storm? 10  
 b) Ordinates of a 3 hour UH are given below. Find the ordinate of 6 hour UH using S-curve:

Time (hrs)	0	3	6	9	12	15	18	21	24
Ordinate of 3hr UH	0	20	50	60	50	40	20	10	0

10

- Q.7 a) Derive expression for the steady state flow into a well under unconfined aquifer conditions. 10
- b) Write short notes on: i) Water table and its fluctuations.  
ii) Darcy's law and its validity. 10

**End Semester Examination, May 2017**  
**B. Tech.—Seventh/ Eighth Semester**  
**FOUNDATION ENGINEERING (C-804)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANY TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

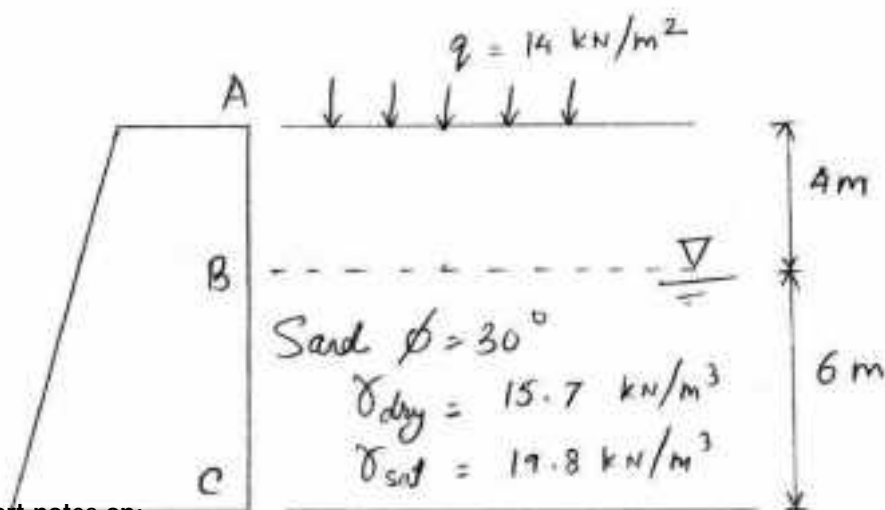
Q.1 Answer the following:

- a) List the different types of slopes with diagrams.
- b) What is active earth pressure and passive earth pressure?
- c) Find the values of  $K_a$  and  $K_p$  for  $\phi = 30^\circ$
- d) What is critical depth for a cohesive soil?
- e) What are cofferdams?
- f) What are the different types of footing?
- g) Explain gross pressure or gross load intensity.
- h) What is Taylor's stability number?
- i) What are geotextile and where are they used?
- j) Define 'natural frequency' and 'resonance'.

2 × 10

**PART-A**

- Q.2
- a) Explain different types of factor of safety used in slope stability. 5
  - b) Describe the Swedish circle method and find out the factor of safety with the help of neat sketches. 10
  - c) How will you locate the most critical circle? Describe with the help of a diagram. 5
- Q.3
- a) State Rankine's theory and calculate the total active pressure using this theory in case of:
    - i) Cohesionless soil or a vertical smooth wall.
    - ii) Submerged cohesionless soil or a vertical smooth wall. 10
  - b) For an earth retaining wall shown in figure below, draw the earth pressure diagram under active state and find the total thrust (per unit length of wall) and its location.



10

Q.4 Write short notes on:

- a) Cantilever sheet piles in cohesive soil.
- b) Fixed earth support sheet pile walls.
- c) Arching in tunnels.
- d) Design of anchored bulk heads.

5 × 4

**PART-B**

- Q.5 a) i) What are the different types of shallow foundation? Explain with the help of neat sketches.  
 ii) Differentiate between 'shallow' and 'deep foundation'. 10
- b) i) Classify piles on the basis of material and composition.  
 ii) A Wooden pile is being driven with a drop hammer weighing 20 kN and having a free fall of 1.5 m. The penetration in the last blow is 5 mm. Determine the load carrying capacity of pile according to engineering new formula. Take  $C=2.5$  cm and  $F=6$ . 10
- Q.6 a) Define the following terms:  
 i) Safe bearing pressure.  
 ii) Net pressure intensity.  
 iii) Ultimate bearing capacity.  
 iv) Net ultimate bearing capacity.  
 v) Net safe bearing capacity. 10
- b) A 2 m wide strip footing is formed at a depth of 1.5 m below ground level in a bed of sand having following properties,  $\phi = 36^\circ$ ,  $\gamma = 1.89 \text{ t/m}^3$ , Calculate the net safe bearing capacity.  
 Given  $N_c = 60$ ,  $N_q = 42$ ,  $N_{\gamma} = 47$ .  
 Assume factor of safety 3. Use Terzaghi analysis. 10
- Q.7 a) What do you mean by 'machine foundation'? Describe its types. 10
- b) Define the following terms:  
 i) Frequency  
 ii) Damping  
 iii) Block foundation  
 iv) Reinforced earth wall. 10

**End Semester Examination, May 2017**  
**B. Tech.–Seventh Semester**  
**ELEMENTS OF EARTHQUAKE ENGINEERING(C-821A)**

Time: 3 hrs.

Max Marks:100

No. of pages:2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

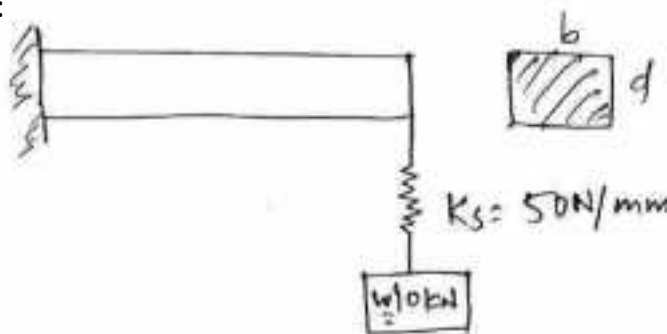
Q.1 Answer the following:

- a) Define 'earthquake'.
- b) What are different types of seismic waves?
- c) What is Richter scale?
- d) Define 'dynamic loads and its various types'.
- e) What are the different types of irregularities in building?
- f) Define 'D' Alembert principle'.
- g) What is damping?
- h) Define 'response reduction factor'.
- i) Define 'retrofitting'.
- j) What do you understand by grouting?

2 × 10

**PART-A**

- Q.2 a) Write a short note on: 'elastic rebound theory'. 8  
 b) Write a short note on: 'effects of earthquakes'. 6  
 c) Explain 'magnitude' and 'intensity of an earthquake'. 6
- Q.3 a) Define the following:  
 i) lumped mass.  
 ii) Critical damping.  
 iii) Zone factor. 8  
 b) Determine time period and natural frequency of the system in the figure given below:



$$b = 400 \text{ mm}$$

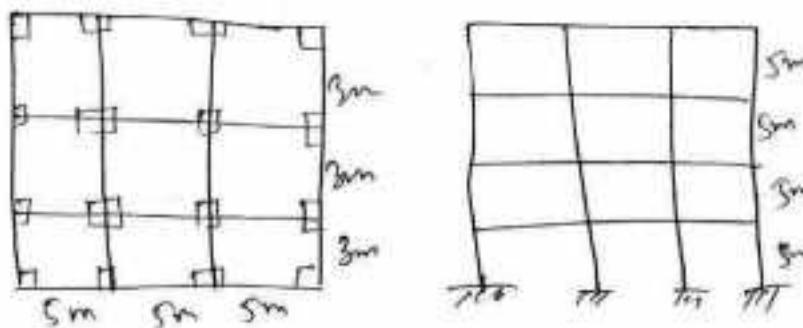
$$d = 450 \text{ mm}$$

$$L = 5 \text{ m}$$

$$W = 10 \text{ kN}$$

12

- Q.4 The plan and elevation of four storey RCC school building is shown in the figure given below. The building is located in Delhi. The type of soil encountered is hard soil and is proposed to design with special moment resisting frame. The intensity of D.L. is  $10 \text{ kN/m}^2$  and the floors has live load  $3 \text{ kN/m}^2$ . Determine the design seismic load on structure by static analysis. Also shown design seismic forces at different floor level.



20

**PART-B**

- Q.5 A simply supported beam 4m long supports a mass of 200 kg at the mid span. Determine its natural frequency and natural period of vibration,  $E = 2.8 \times 10^5 \text{ N/mm}^2$ ,  $I = 30 \times 10^6 \text{ mm}^4$ . 20
- Q.6 a) What are different types of failures that occur in RC building? 8  
b) Write a short note on 'retrofitting and strengthening of RC columns and beams. 12
- Q.7 a) What are the different mode of failure of masonry structures. 8  
b) Explain box action and band action of masonry walls. 12



**End Semester Examination, May 2017**  
**B. Tech.– Seventh/Eighth Semester**  
**ADVANCED TRAFFIC ENGINEERING (C-824)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) Write the expression for braking distance.
  - b) What are the types of parking?
  - c) Elaborate PCU and LOS.
  - d) What is the difference between practical capacity and theoretical capacity?
  - e) List out two signs from each i) warning sign ii) Informatory sign iii) Mandatory sign.
  - f) What do you understand by arboriculture?
  - g) What is motor vehicle act?
  - h) Write the expression used in Webster's method for the calculation of cycle time.
  - i) Define 'capacity flow'. Also mention the relation between capacity, density and velocity.
  - j) What is collision and condition diagram? 2 × 10

**PART-A**

- Q.2
- a) Draw a flow chart showing the organizational set up of traffic engineering department in India. 10
  - b) What are the various traffic characteristics and their effect on design elements of road? Explain. 10
- Q.3
- a) Enumerate the different method of carrying out traffic speed studies. Indicate the significance of each. How will represent the data for analysis? 10
  - b) Write down the various causes of road accidents and their preventive measures. How will you determine the velocity of a vehicle which hits a parked vehicle at an angle  $\alpha$ ? 10
- Q.4
- a) Draw the relation graph between speed and traffic volume. From the same graph how will you determine the level of service of any road? Mention all the types of LOS. 10
  - b) i) What is the difference between space and times headway? Give an expression for capacity using space and time headway. 5  
 ii) Estimate the basic capacity of traffic lane at a speed of 50 kmph. Assume that all the vehicles are of average length of 6 m. 5

**PART-B**

- Q.5
- An isolated signal with pedestrians indication is to be installed on a right angled intersection with road A, 20 m wide and road B 15 m wide. The heaviest volume per hour for each lane of road A and B are 260 and 225 respectively. The approach speeds are 55 and 40 kmph for road A and B respectively. Design the timing of traffic and pedestrian signal using IRC method and also apply websters check. 20
- Q.6
- a) Explain the need for traffic regulations. How important it is to regulate the speed of vehicles and why? 10
  - b) Define the following:
    - i) Tidal flow operations.
    - ii) Road pricing.
    - iii) Traffic restraint.

iv) Motor vehicle act.

v) Regulation of drivers.

**4x5**

- Q.7**
- a) What are the various detrimental effects of traffic on environment? **10**
  - b) Write down the various factors that effect the fuel consumption in a vehicle. **10**

**End Semester Examination, May 2017**  
**B. Tech.–Sixth Semester**  
**PROJECT PLANNING AND MANAGEMENT(C-826)**

Time: 3 hrs.

Max Marks:100

No. of pages:2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

Q.1 Define the following:

- a) Slack.
- b) FET and LET,
- c) LST and EST,
- d) Project crashing.
- e) Types of concrete mixers.
- f) Dumpers and Transit mixers.
- g) Free float.
- h) Variable and fixed cost.
- i) List out four equipments needed for excavation.
- j) What is 10/7 mixers?

2 × 10

**PART-A**

Q.2 a) Explain Dummy activity: Where are they used. Draw network for explaining your points? 10  
 b) What are advantages and disadvantages of bar chart over PERT? 10

Q.3 a) What is project estimated time? Explain the mathematical expression with example. 10  
 b) What do you understand by "Project life cycle"? What are its different phases? 10

Q.4 Mark critical path for the following case:

S. No.	Activity	T <sub>o</sub>	T <sub>m</sub>	T <sub>p</sub>	Preceding activity	Succeeding activity	Remarks
1.	A	6	8	12	Nil	B	
2.	B	7	9	12	A	C	
3.	C	2	4	6	A,B	D	
4.	E	5	6	8	Nil	F	
5.	D	10	12	16	C,F	Nil	
6.	F	3	5	8	E	D,G	
7.	G	5	8	10	E,F	H	
8.	H	1	2	3	G	Nil	
9.	J	1	2	3	I	H,K	
10.	I	5	7	10	Nil	J	
11.	K	3	6	8	J	Q	
12.	Q	2	4	6	K	Nil	

20

**PART-B**

Q.5 A project consists of six activities as detailed below. Determine optimum project completion time and cost assuming indirect cost @ `10,000/- per week.

Time in weeks			Direct cost in `	
Activity	Normal Time	Crash Time	Normal Cast	Crash Cost
1-2	8	6	8,000	10,000
1-3	5	4	6,000	9,000

1-4	10	6	14,000	16,000
2-4	9	8	8,000	10,000
3-4	7	5	6,000	8,000

20

- Q.6 a) State the working of a hot mix plant for road construction. Draw a neat sketch and mark the process of the plant. 10
- b) What are the *criteria* for selection of a batching plant? Draw a sketch of batching plant. 10
- Q.7 Write short notes on:
- a) Dumper.
  - b) Concrete Pump.
  - c) Road Roller.
  - d) Compressor.
- 5 × 4

**End Semester Examination, May 2017**  
**B. Tech.—Seventh Semester**  
**PRE-STRESSED CONCRETE (C-827)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q. 1 is compulsory. Attempt ANY TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Answer the following:

- a) Name two post tensioning systems.
- b) What are the limitations of using pre-tensioning system over post tensioning system?
- c) Define 'application of post-tensioning'.
- d) What is tendon splice?
- e) What is concentric tendon?
- f) Write the assumptions for analysis of pre-stressed concrete structures.
- g) Name the losses involved in pre-stressed concrete structures.
- h) What is cracking moment?
- i) What are the factors influencing deflection?
- j) What is creep?

2 × 10

**PART-A**

Q.2 A pre-stressed concrete beam of section 200 mm wide by 300 mm deep is used over an effective span of 6 m to support an imposed load of 4 kN/m. The density of concrete is  $24 \text{ kN} / \text{m}^3$ .

At the center-of-span section of beam, find the magnitude of:

- a) Concentric pre-stressing force necessary for zero fibre stress at the soffit when beam is fully loaded.
- b) The eccentric pre-stressing force located 100 mm from the bottom of the beam which would nullify the bottom fibre stresses due to loading.

20

Q.3 A pre-stressed concrete beam with a rectangular section 120 mm wide and 300 mm deep supports a uniformly distributed load of  $4 \text{ kN} / \text{m}$ , which includes the self-weight of beam. The effective span of beam is 6m. The beam is concentrically pre-stressed by a cable carrying a force of 180 kN. Locate the position of pressure line in beam.

20

Q.4 Write short notes on the following:

- a) Hoyer's long line method of pre-stressing.
- b) Concept of load balancing.
- c) Hydrogen embrittlement.
- d) Why high strength material is required in pre-stressed concrete.
- e) Freyssinet system of post tensioning.

4 × 5

**PART-B**

Q.5 A pre-tensioned beam 200 mm wide and 300 mm deep is pre-stressed by 10 wires of 7 mm diameter initially stressed to  $1200 \text{ N} / \text{mm}^2$ ; with their centroids located 100 mm from the soffit. Find maximum stress in concrete immediately after transfer, allowing only for elastic shortening of concrete.

If concrete further undergoes shortening due to creep and shrinkage while there is a relaxation of 5% steel stress. Estimate final % age loss of stress in wires.

Consider  $E_c = 5700(f_{cu})^{1/2}$   $E_s = 210 \text{ kN/mm}^2$ ,  $f_{cu} = 42 \text{ N/mm}^2$ ,  $\phi = 1.6$  . Total residual shrinkage strain  $= 3 \times 10^{-4}$  . 20

- Q.6 A deck of a pre-stressed concrete culvert is made up of a slab 500 mm thick. The slab is spanning over 10.4m and supports a total uniformly distributed load comprising the dead and live load of  $23.5 \text{ kN/m}^2$ . The concrete slab is pre-stressed by straight cables each containing 12 high tensile wires of 7 mm dia stressed to  $1200 \text{ N/mm}^2$  at a constant eccentricity of 195 mm. The cables are spaced at 1000 mm intervals in the transverse direction. Estimate the instantaneous deflection of the slab at the center of span under pre-stress and imposed load. 20
- Q.7 A pre-stressed concrete beam of uniform rectangular C/s and span 15 m supports a total distributed load of 275 kN (excluding wt of beam). Determine suitable dimension of beam of calculate the area of tendons and their position. The permissible stresses are  $14 \text{ N/mm}^2$  for concrete and  $1050 \text{ N/mm}^2$  for tendons. 20

**End Semester Examination, May 2017**  
**B. Tech.– Seventh Semester**  
**EARTHQUAKE RESISTANT DESIGN OF STRUCTURES(C-829)**

Time: 3 hrs.

Max Marks:100

No. of pages:2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks. IS 456-2002, IS-13920-1993 and IS-1893-2002, is allowed.*

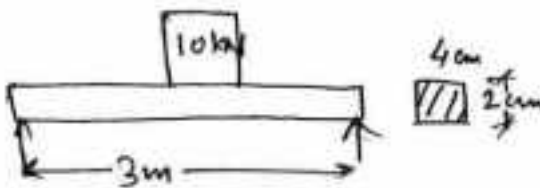
Q.1 Briefly answer the following:

- a) What is an earthquake?
- b) Define 'seismic waves and what are its different types'.
- c) What are dynamic loads?
- d) Define 'stiffness'.
- e) What is ductility?
- f) What do we understand by damped frequency?
- g) Define 'a multi-degree freedom system'.
- h) What do you understand by extreme soft storey?
- i) What is plain irregularity?
- j) Define coupling'.

2 × 10

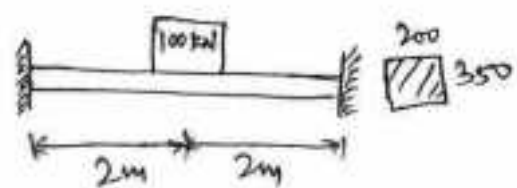
**PART-A**

- Q.2
  - a) Write a short note on "Elastic rebound theory". 8
  - b) What are seismograph and seismograms? 6
  - c) Explain the different effects of an earthquake in detail. 6
- Q.3
  - a) What is the difference between 'damping constant' and damping ratio'. 3
  - b) Define 'response spectrum'. 2
  - c) Determine the time period and natural frequency of the following figure given below:



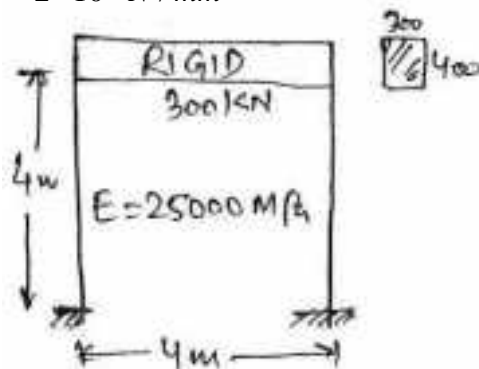
(a)

$$E = 2 \times 10^5 \text{ N/mm}^2$$



(b)

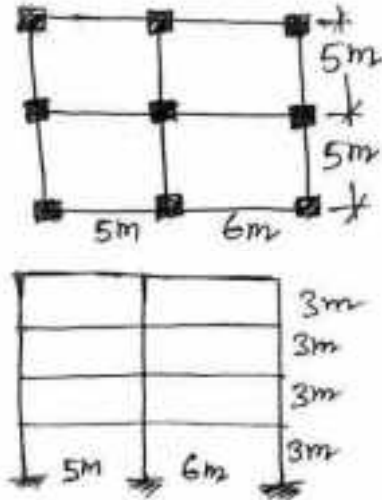
$$E = 25000 \text{ MPa}$$



(c)

15

- Q.4 The plan and elevation of four story RCC school building is shown in the figure given below. The building is located in Bangalore. The type of soil encountered is medium soil and is proposed to design with ordinary RCC moment resisting frame. Determine the design seismic load on structure by static analysis. Also show design seismic forces at different floor levels.



The intensity of dead load is  $20 \text{ kN/m}^2$  and the floor has a live load of  $30 \text{ kN/m}^2$ .

Given data: slab thickness = 150 mm

All columns =  $400 \text{ mm} \times 400 \text{ mm}$

All beams =  $300 \text{ mm} \times 450 \text{ mm}$

Wall thickness = 120 mm all-around

20

### PART-B

- Q.5 a) Write a short note on confining effect of transverse reinforcement. 5  
b) ARC column of size  $450 \text{ mm} \times 450 \text{ mm}$  subjected to following loads. The column has unsupported length of 4.5m. Use M25 grade of concrete and Fe415. Assume  $d'/D = 0.1$ .

	DL	LL	Seismic Load
Axial Load (kN)	900	650	560
Moment (kNm)	70	100	150

Design the column as per requirements of IS: 13920-1993.

15

- Q.6 a) Write a short note on 'objectives of seismic retrofitting'. 7  
b) Write a short note on 'building deficiencies'. 7  
c) Explain different column strengthening techniques. 6
- Q.7 a) What are different modes of failure of a masonry structure? 7  
b) Write a short note on 'different retrofitting technique in masonry structure'. 6  
c) Explain box action and band action of masonry walls. 7



**End Semester Examination, May 2017**  
**B. Tech.– Seventh Semester**  
**ADVANCED CONCRETE TECHNOLOGY(C-830)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Briefly answer:

- a) Why gypsum is added to cement?
- b) Define 'accelerators'.
- c) What are deleterious substances?
- d) Name four tests for measuring workability.
- e) What is curing?
- f) Define 'dynamic modulus of elasticity'.
- g) What do you mean by characteristic compressive strength?
- h) What is efflorescence?
- i) Write the test conducted on hardened concrete.
- j) Give two advantages of light weight concrete.

2 × 10

**PART-A**

- Q.2
- a) Write the physical properties of cement and explain any two in detail. 6
  - b) Explain the features of gap-graded aggregate. 6
  - c) Explain mechanism of hydration with a graph showing contribution of cement compounds to strength of cement paste. 8

Q.3 Write short notes on:

- a) Retarders.
- b) Pozzolanic action of silica fumes.
- c) Air entraining admixture.
- d) Plasticizers.
- e) Mineral admixtures.

4 × 5

- Q.4 Design a M 50 grade concrete using flyash and OPC 43 grade cement, having maximum size of aggregate as 10 mm, minimum and maximum cement content as 320 kg/m<sup>3</sup> and 450 kg/m<sup>3</sup> respectively w/c ratio is 0.45 (max.). Workability required is 50 mm (slump). Type of aggregate used is crushed angular, super plasticizer is used. Specific gravity of cement is 3.15, specific gravity of coarse and fine aggregate of zone I is 2.74, specific gravity of super plasticizer is 1.145. Assume other data suitably. 20

**PART-B**

- Q.5
- a) Explain the terms:
    - i) Initial tangent modulus.
    - ii) Secant modulus.
    - iii) Tangent modulus. 8
  - b) What are the factors affecting modulus of elasticity? Explain. 6
  - c) Draw stress-strain curve for concrete. 6
- Q.6
- a) Explain the alkali-aggregate reaction and ways to control and prevent the same. 8
  - b) Describe various factors governing shrinkage. 6
  - c) What is the significance of durability? How can one relate strength with durability? 6

Q.7 Write short notes on:

- a) Hot weather concreting.
- b) Polymer concrete and its application.
- c) Fibre-reinforced concrete.
- d) Structural light weight concrete.

**5x4**

**End Semester Examination, May 2017**  
**B. Tech.–Seventh Semester**  
**ENVIRONMENTAL AIR POLLUTION(C-831)**

Time: 3 hrs

Max Marks: 100

No. of pages: 3

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer briefly:

- a) Define 'biosphere'?
- b) Expand WHO, CPCB, RSPM and MoST.
- c) What are quasi emission standards?
- d) List a few uses of air dispersion model.
- e) List two important initiatives on air quality management undertaken by CPCB.
- f) What role is played by Ministry of Urban Development (MoUD) in context of air pollution?
- g) Define 'environmental lapse rate'.
- h) What do you understand by carbon credit?
- i) What is acid rain?
- j) What steps has India taken as a member of Stockholm declaration. 2x10

**PART-A**

- Q.2
  - a) List various air pollutants effecting plants and discuss their effects. 10
  - b) A coal fired 1000 MW power plant is operating around 38% efficiency. The ash and sulphur content in the coal used respectively are 35% and 3% and the calorific value of 21 MJ per kg of coal. Find the emission rate of SO<sub>2</sub> form the plant. 10
- Q.3
  - a) Three major pollutants in a city were particulate matter, SO<sub>2</sub> and CO. The concentration of PM is 84µg/m<sup>3</sup> and CO is 14.2µg/m<sup>3</sup>. Calculate the air quality index and state the level of air pollution. 5
  - b) A company with staff strength of 1200 is planning to provide a carpool facility to its employees. It is proposed that each car will ferry 4 passengers after implementation of program. Compute the total emission, reduction in emission of pollutants and vehicle miles travelled with and without carpool for the following given emission factors:  
 CO=9.4gm/km, NO<sub>x</sub>=0.693gm/km, PM<sub>10</sub>=0.0044 gm/km, PM<sub>2.5</sub>=0.0041gm/km, CO<sub>2</sub>=368.4gm/km. The diesel consumption of proposed fleet can be taken as 22km/lit. 10
  - c) What is the objective of national ambient air quality standards? 5
- Q.4
  - a) What role does topography plays in dispersion of pollutants? 5
  - b) Describe the operating problems of settling chambers? 5
  - c) Describe the role of ministry of science and technology as a stakeholder to air quality. 10

**PART-B**

- Q.5
  - a) A coal fired thermal power plant burns 6.25 tons of coal/hr and discharges the combustion products through a stack having an effective height of 80m. The coal has sulphur content of 5.3% and the wind velocity at the top of stack is 8.0m/sec.

Atmospheric condition are moderately to slightly unstable. Determine the ground level concentration at a distance of 2 km downwind at

- i) The centre line of the plume
  - ii) At a cross wind distance of 0.5 km on either side of the centre line. 10
- b) Explain the working principle of high volume sampler and interferences encountered in sampling using it. 10
- Q.6
- a) What is Sick Building Syndrome? Discuss various causes and prevention measures of same. 10
  - b) Discuss various causes of air pollution. 5
  - c) Discuss the effects of space occupancy on ventilation. 5
- Q.7
- a) Discuss various causes of ozone depletion. 6
  - b) Discuss salient features of Kyoto Protocol. 6
  - c) Deduce the CFC number of the following given compounds:
    - i.  $\text{CCL}_2\text{FCCLF}_2$
    - ii.  $\text{CHF}_2\text{CL}$
    - iii.  $\text{CH}_3\text{CF}_3$
    - iv.  $\text{CH}_3\text{CFCL}_2$  8



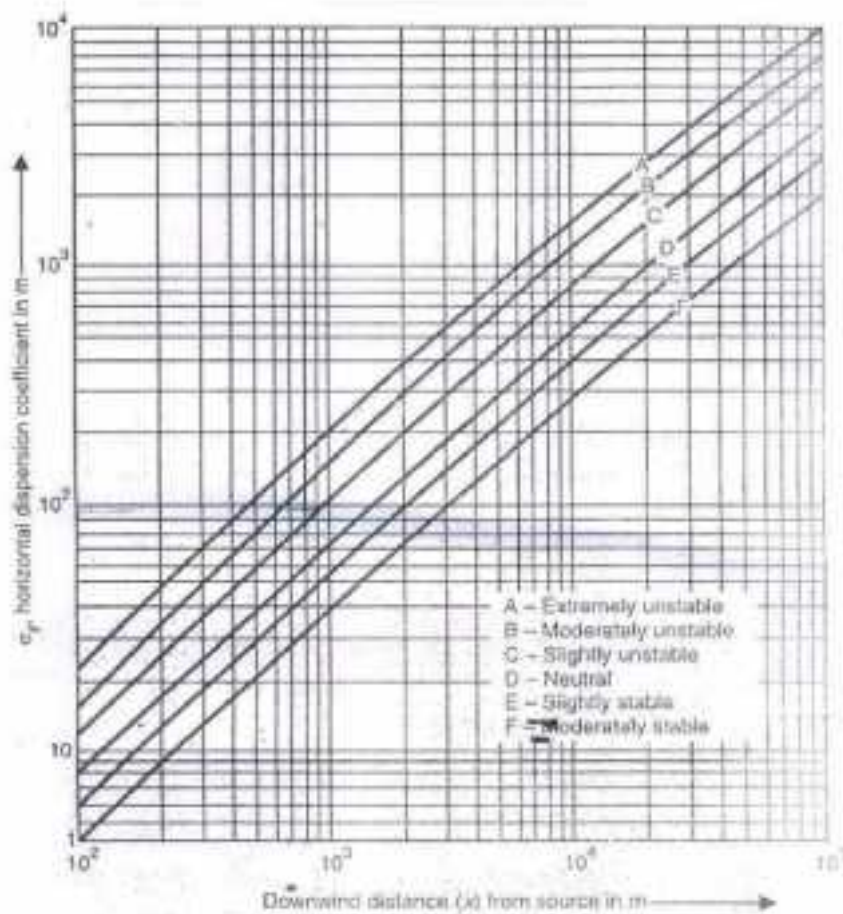


Fig. 18.7.  $\sigma_y$  vs  $x$  for different atmospheric stabilities.

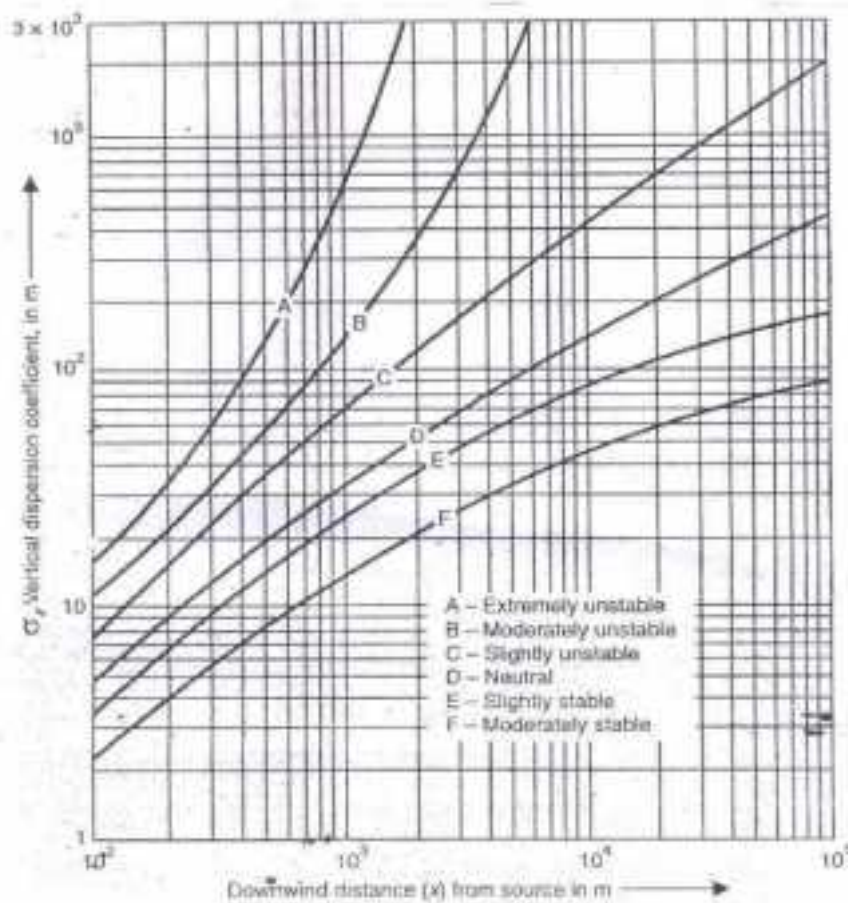


Fig. 18.8.  $\sigma_z$  vs  $x$  for different atmospheric stabilities.

**End Semester Examination, May 2017**  
**B. Tech.–Sixth Semester**  
**GROUND IMPROVEMENT TECHNIQUES (C-836)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Briefly explain the following:

- a) Principle of vibratory rollers and compaction piles.
- b) Suitable soil condition of chemical grouting.
- c) Densification.
- d) Moisture density relationship with air voids.
- e) Time prediction for real problem with vertical drains.
- f) General principle of vertical drains.
- g) Geotextiles.
- h) Uniaxial and Biaxial grid.
- i) Define 'rock bolting'.
- j) Permeation grouting and compaction grouting.

2 × 10

**PART-A**

Q.2 a) Briefly write down method, principle, most suitable soil condition, maximum effective treatment depth of the following:

- i) Pre compression.
- ii) Reinforcement.
- iii) Thermal.

5 × 3

b) Briefly explain the following with their availability in India:

- i) Alluvial deposit.
- ii) Lateritic soil.

2½ × 2

Q.3 a) Explain soil characteristics and rating for construction of group symbol in respect of soil, compaction characteristics and type of rollers, volume change, drainage and permeability value as sub grade not subject to frost, value as base for pavement;

- i) GW
- ii) GP
- iii) GM
- iv) GC
- v) SW

2 × 5

b) Briefly write down static compaction equipment with neat sketch.

5

c) Explain engineering behaviour of compacted fine grained soil.

5

Q.4 a) Explain all basic categories of construction of dewatering method and their selection with neat sketches.

6

b) Explain with neat sketch dewatering by electro-osmosis.

- i) Mechanism of electro osmosis.
- ii) Hypothetical distribution of ion between external and internal phases in clay pore.

5 × 2

c) Write down pre compression principles and pre loading method.

4

**PART-B**

Q.5 a) Briefly explain construction sequence of embankment for placing Geosynthetics.

5

b) Explain with neat sketch:

- i) Ideal reinforcement pattern.
- ii) Reinforcement placed before structure.
- iii) Practical reinforcement pattern.

iv) Reinforcement placed after structure. 5

c) Briefly explain with neat sketch.

i) Cross section of a single clay liner system for a landfill.

ii) Cross section of single geomembrane liner system for a landfill.

iii) Cross section of double liner system-type-I.

iv) Cross section of double liner system type-II.  $2\frac{1}{2} \times 4$

Q.6 a) Write down the different components part with neat sketches of soil nailing:

i) Function and application of soil nailing.

ii) Limitation of soil nailing.

iii) Advantage of soil nailing.

iv) Method of construction of soil nailing. 5x4

Q.7 a) Explain procedure of grouting. 10

b) What are different types of grouting? Write down advantage and disadvantage of compaction grouting. 5

c) Define chemical stabilization with lime calcium and sodium chloride, lignin, waterproof. 5



**End Semester Examination, May 2017**  
**B. Tech.–Sixth Semester**  
**HAZARDOUS WASTE MANAGEMENT (C-838)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Briefly answer the following:

- a) Define 'corrosive waste' and 'toxic waste' with suitable examples.
- b) Expand PVC, PETE and PP.
- c) Components of hazardous waste management.
- d) What is EIA?
- e) Principle of hazardous waste management.
- f) List various analytical approaches for hazardous waste characterization.
- g) What are the significant control parameters in composting?
- h) Define biological treatment processes with suitable examples.
- i) List various physical treatment processes of hazardous waste.
- j) What do you understand by encapsulation and solidification?

2 × 10

**PART-A**

- Q.2 a) Explain the different sources, characteristics and health impacts of hazardous wastes. 10
- b) Explain the different routes of transportation of hazardous wastes in the sub surface and atmospheric environment. 10
- Q.3 a) A town where 11 million households, each fill one 400litre capacity container of solid waste per week. Estimate the total landfill volume required to dispose of this solid waste, if, 11% of the landfill volume is occupied by the cover dirt. The density of the refuse when collected is 150kg/m<sup>3</sup> and is 750kg/m<sup>3</sup> in the landfill. 10
- b) Explain the different stages of hazardous waste management. 10
- Q.4 a) Explain different hazardous waste treatment technologies with suitable examples. 10
- b) Derive an approximate molecular formula for the organic portion of a solid wastes sample with the following composition. Using the chemical composition obtained, determine the energy content of the solid waste. Take 100kg sample of solid waste.

S.No	Component	Moist mass (kg)	Dry Mass(kg)	C(kg)	H(kg)	O(kg)	N(kg)	S(kg)	Ash(kg)
1.	Food wastes	15	4.50	2.160	0.288	1.692	0.117	0.018	0.225
2.	paper	45	42.3	18.40	2.538	18.612	0.127	0.084	2.538
3.	cardboard	5	4.75	2.090	0.280	2.118	0.014	0.009	0.237
4.	plastics	5	4.90	2.940	0.352	1.117	-	-	0.490
5.	Yard wastes	10	4.00	1.912	0.240	1.520	0.136	0.012	0.180
6.	wood	5	4.00	1.980	8.240	1.788	0.008	0.004	0.060

10

**PART-B**

- Q.5 a) Explain aerobic and anaerobic process of hazardous waste treatment with suitable examples and also explain nitrogen cycle in hazardous waste treatment. 10

- b) Explain briefly the parameters required for site selection and design of hazardous waste landfill. 10
- Q.6 a) Explain the sources and impacts of biomedical wastes. Discuss with examples all categories of biomedical wastes. 10
- b) Write short notes on:
- i) Segregation, handling and disposal of biomedical wastes.
  - ii) Treatment and destruction of biomedical wastes. 10
- Q.7 a) Discuss suitable strategies for the remediation of a contaminated site. What technique would you suggest for site contaminated with radioactive wastes? Give reasons. 10
- b) What are the sources of radioactive waste and E-waste? Discuss classification and characteristics of E-waste and radioactive waste. 10

**End Semester Examination, May 2017**  
**B. Tech.–Second Semester**  
**ENVIRONMENTAL STUDIES (CH-202A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) What are the biotic and abiotic factors?
  - b) What is the importance of environmental studies?
  - c) Why plants are called producers?
  - d) What are the secondary pollutants?
  - e) On which date world environment day is celebrated?
  - f) Which pollutant is responsible for ozone-depletion? Name the layer of atmosphere in which chemical reaction takes place between  $O_3$ .
  - g) Define biodiversity and write the names of levels of biodiversity.
  - h) Define 'poaching'.
  - i) Mention any two water pollution related diseases.
  - j) What do you mean by disarmament?
- 2 × 10

**PART-A**

- Q.2
- a) What is deforestation and land degradation? Explain its causes and effects in brief. 5
  - b) Discuss the multidisciplinary nature of environmental studies in brief. 5
  - c) Write the various energy sources you use every day. How could you reduce their use? 5
  - d) What is mining? What are its environmental impacts? 5
- Q.3
- a) What are ecological pyramids? Discuss its type with suitable diagrams. 5
  - b) Write a brief note on 'forest ecosystem'. 5
  - c) Define food chain and food web with examples. 5
  - d) What are the biotic and abiotic factors of aquatic ecosystem? 5
- Q.4
- a) Discuss the importance of biodiversity. 5
  - b) What do you mean by hot-spots of biodiversity? Name the hot spots present in India. 5
  - c) What are the major threats to biodiversity? 5
  - d) Write informative notes on (*any two*) of the following:
    - i) Ex-situ conservation.
    - ii) Endemic and endangered species.
    - iii) Over exploitation of natural resources and its consequences. 5

**PART-B**

- Q.5
- a) What is acid rain? How is it caused? What are its bad effects on the man and his environment? What steps are needed to control acid rain? 5
  - b) Discuss the causes, sources and effects of marine pollution. 5
  - c) What are the greenhouse gases? Write a note on greenhouse effect in brief. 5
  - d) What is solid waste? Classify them on the basis of degradable ability and write the methods for their management. 5
- Q.6
- a) What are the major issues related to rehabilitation of displaced people? Discuss with a small case study. 5

- b) Why the rain water harvesting needs to be promoted? Explain in brief. 5
  - c) Discuss the basic features of the Air (Prevention and Control of Pollution) Act, 1981. 5
  - d) What are the salient provisions in Wild Life Act? 5
- Q.7
- a) What was CWC (Chemical Weapon Convention)? Why did it come into force and what were its responsibilities? 5
  - b) What do you mean by bioterrorism? Explain with suitable examples. 5
  - c) Write short notes on (*any two*):
    - i) Environment and human health.
    - ii) Role of IT in environment.
    - iii) Carrying capacity. 5
  - d) Discuss the wasteland reclamation in brief. 5

**End Semester Examination, May 2017**  
**M. Tech. (Construction Management) - Second Semester**  
**PROJECT PLANNING AND CONTROLS(C-MC-101)**

Time: 3 hrs

Max Marks: 75

No. of pages: 2

Note: *Attempt FIVE questions in all; Q. 1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Define and explain the following:

- a) EST and LST.
- b) Milestone chart vs. CPM.
- c) Total cost and cost slope.
- d) Project parameters.
- e) Time estimates.
- f) Normal time vs Crash Time.
- g) ABC classification of store inventory.
- h) Non-human resources in Resource planning.
- i) "Time-cost" trade off.
- j) Resources allocation.

1½x10

**PART-A**

- Q.2
- a) What is the difference between PERT and CPM? 5
  - b) Define Event and Activity. 5
  - c) State types of floats. Write their formulas. 5

Q.3 A project consists of twelve activities. Their time estimates are given below. Draw time scale network.

Activity	Description	Time (Weeks)
0-1	A-1	6
0-3	B-1	4
0-6	D-1	3
1-2	A-2	6
3-4	B-2	4
6-7	D-2	5
3-7	e	4
7-5	Dummy	0
2-5	A-3	2
4-5	E-1	6
5-8	E-2	4
7-8	D-3	10

Mark critical path.

15

- Q.4
- a) What is the probability of completion of project in twenty weeks for a project whose network indicates sixteen weeks as completion period. The standard deviation for the network is 2.235. 8
  - b) i) Explain resource leveling with one example.  
ii) What do you understand by Resource Smoothing? 7

**PART-B**

- Q.5 A project consists of following activities; determine optimum project completion time assuring indirect cost of Rs. 16,500 per week.

Activity	Times in weeks		Direct cost in Rs	
	Normal Time	Crash Time	Normal Time	Crash Time
1-2	7	6	800	1100
1-3	6	4	700	1300
1-4	9	6	1100	1500
2-4	5	3	1700	2500
3-4	4	3	2100	3000

Also, calculate optimum cost and time to which project can be crashed.

15

- Q.6 A construction company stocks various items in the store. The average annual consumption and cost per unit in given below. Classify the items as per ABC analysis.

Name of Item	Average annual consumption	Average cost per unit in Rs.
A	7000	40
B	2000	95
C	4500	2100
D	5525	1150
E	75	275
F	8000	52.75
G	5500	16.75
H	50	475

15

- Q.7 Write notes on:
- Computer and its project work application.
  - Resource Planning and Leveling.
  - Material and Machine Management.

5x3

**End Semester Examination, May 2017**  
**M. Tech. (Construction Management)–Second Semester**  
**CONSTRUCTION ECONOMICS AND FINANCE (C-MC-201)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

**Q.1 Define the following:**

- a) Value of money.
- b) Payback period.
- c) NPV, SCAF, GGF.
- d) IRR, IROR, RRM.
- e) Statistical bidding strategy models.
- f) Risk classification.
- g) Data collection for risk management.

**Fill in the blanks:**

- h) ₹50,000/- now is equivalent to \_\_\_\_\_ after 10 years, at a rate of interest 10%.
- i) At an interest rate of \_\_\_\_\_%, ₹5,00,000/- invested today will be worth ₹10,00,000/- in 9 years.
- j) Total cost = \_\_\_\_\_ + indirect cost. 1½ × 10

**PART-A**

- Q.2**
- a) What factor affects project cash flow? Explain concept of margin and retention. 5
  - b) The details of the financial transactions during the months of April, May and June for M/S Sigma are given below. Draw a net cash flow diagram for the transactions using a month as a single unit, showing all transactions during a month at the end of the months.

Date	Description	Amount (in ₹)
April 5	Receipt for running account bill no. 7	2,50,000
April 15	Salary distribution	1,25,000
April 16	Payment for supply of aggregates	50,000
April 30	Payment for supply of furnitures	80,000
May 5	Receipt for running account bill no. 8	3,10,000
May 15	Salary distribution	1,25,000
May 25	Payment for supply of cement	80,000
June 5	Receipt for running account bill no 9	2,90,000
June 14	Salary distribution	1,25,000
June 28	Payment for supply of steel	1,10,000

10

- Q.3**
- a) What is Minimum Attractive Rate of Return (MARR)? Explain the concept and how does it differ from IRR (Internal Rate of Return Method)? 8
  - b) Write down the formula for modified discount rate. Discuss it with examples. 7
- Q.4**
- a) What do you understand by "price escalation clause"? Explain. 8
  - b) Explain the term: depreciation. How is it worked out for calculating present worth? 7

**PART-B**

- Q.5 a) Explain in brief:  
       i) Return on Assets (ROA).  
       ii) Return on capital employed (ROCE). 3 × 2  
 b) What do you understand by risk? What are the risk identification processes? 9
- Q.6 Write notes on *any two* of the following:  
 a) Insurance in construction industry.  
 b) Risks in international construction. 7½ × 2
- Q.7 a) What is budgeting and budgetary control system? Explain the international finance for a project in India. 7  
 c) Explain working capital management. How will you plan for multiple source finance? 8



**End Semester Examination, May 2017**  
**M. Tech.—Second Semester**  
**CONSTRUCTION PERSONNEL MANAGEMENT (C-MC-203)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Answer in brief:

- a) Define 'Personnel Management'.
- b) What are the three standpoints of human resource management?
- c) List out the functions of personnel manager.
- d) Draw an organizational structure of the personnel department.
- e) List the welfare measures taken for the employees in an organization.
- f) What are the objectives of human resource planning?
- g) List out any five factors affecting recruitment.
- h) What do you understand by 'sons of the soil'?
- i) Draw a list of types of psychological tests classified on the basis of human behavior.
- j) What is the purpose of promotions? 1½ × 10

**PART-A**

Q.2 What are the major personnel management processes in an organization? Discuss in detail. 15

Q.3 State the techniques of recruitment. Discuss merits and demerits of each. 15

- Q.4
- a) What are the different selection procedures for recruitment? Why physical health examination is done? 10
  - b) Differentiate between aptitude and attitude of a candidate. 5

**PART-B**

- Q.5
- a) What are the purposes of psychological test? What references are drawn from these tests? 10
  - b) Discuss why psychological test not be discontinued in a recruitment process. 5

Q.6 Write short notes on:

- a) Separation.
- b) Absenteeism.
- c) Compensation. 5 × 3

- Q.7
- a) What are the objectives of motivation? Explain positive and negative motivation with the help of two examples. 5
  - b) Discuss how employee's safety is related to industrial health. Give examples to explain your point. 5
  - c) What are the various styles of leadership? Which one is suitable for peaceful and productive environment in an industrial organization? 5

**End Semester Examination, May 2017**  
**M. Tech. (Construction Management) - Second Semester**  
**RESOURCE MANAGEMENT AND CONTROL IN CONSTRUCTION**  
**(CMC-204)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Write short notes on:

- a) Resource Scheduling.
- b) Indicative cost estimation method.
- c) Classification of labour based on work.
- d) Control in resource planning.
- e) Depreciation cost.

3x5

**PART-A**

- Q.2 Explain the various criteria involved in project resource planning with examples. 15
- Q.3 Why actual measurement of utilization of resources at site is required? And what is its importance in overall project management? 15
- Q.4 A construction company stores various items in its stores. The average annual consumption and cost per unit store are given. Classify the items using ABC analysis and draw the graph also.

Name of Item	Average annual consumption	Average cost per unit (Rs)
a	5000	50
b	800	100
c	1800	200
d	4200	10
e	75	300
f	5500	70
g	1900	70
h	4000	20
i	75	400
j	300	100
k	250	200
l	80	160

15

**PART-B**

- Q.5 Explain in detail:  
 a) Resource allocation.  
 b) Resource constraints.  
 c) Listing of Resources. 15
- Q.6 What are inventory related costs? What are the functions of inventories? 15
- Q.7 a) What is investment cost? How hourly investment cost is calculated? 8  
 b) How can you do resource leveling using software? 7

194/4

**End Semester Examination, May 2017**  
**M. Tech. (Structural Engineering)—First Semester**  
**PRE-STRESSED CONCRETE (C-MS-101)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 1

Note: *Attempt any FIVE questions in all. Each question carries equal marks.*  
*Use of IS: 1343-2012 is permitted.*

Q.1 Attempt all parts:

- a) Write the difference between pre-tensioned and post-tensioned concrete.
- b) Write advantages of pre-stressed concrete over reinforced concrete.
- c) Elaborate the application of post tensioning.
- d) Define 'tension splice'.
- e) Explain stress corrosion.

3x5

- Q.2
- a) Explain long line method of pre-stressing.
  - b) Why high strength materials are required in pre-stressed concrete?
  - c) Draw stress-strain curve for high strength steel.

5 × 3

- Q.3 A box girder of pre-stressed concrete bridge of span 40 m has overall dimension of 1200 mm by 1800 mm. The uniform thickness of wall is 200 mm. The live load analysis indicates a maximum live load moment of 2000 kN m at the centre of span. The beam is pre-stressed by parabolic cables with an effective force of 7000 kN. The cables which are concentric at supports have an eccentricity of 800 mm at the center of span section. Compute the resultant stresses at the centre of span section using the internal resisting couple method.

15

- Q.4 A pre-stressed concrete pile, 250 mm square, contains 60 pre-tensioned wires, each of 2 mm diameter, uniformly distributed over the section. The wires are initially tensioned on prestressing bed with a total force of 300 kN. Calculate the final stress in concrete and the percentage of loss in stress in steel after all losses.

Assume  $E_s = 210 \text{ kN/mm}^2$ ,  $E_c = 32 \text{ kN/mm}^2$ , shortening due to creep =  $30 \times 10^{-6} \text{ mm/mm}$  per  $\text{N/mm}^2$  of stress.

Relaxation = 5%

15

- Q.5 A post tensioned roof girder spanning over 30 m has an unsymmetrical I section with a second moment of area of section of  $(72490 \times 10^6) \text{ mm}^4$  and an overall depth of 1300 mm. The effective eccentricity of group of parabolic cables at the center of span is 580 mm towards the soffit and 170 mm towards the top of beam at supports. The cables carry an initial pre-stressing force of 3200 kN. The self-weight of girder is 10.8 kN/m and live load on the girder is 9 kN/m,  $E_c = 34 \text{ kN/mm}^2$ , Creep coefficient = 1.6, and total loss of pre-stress is 15%. Estimate the:

- a) Instantaneous deflection.
- b) Resultant long term deflection.

15

- Q.6 A pre-tensioned pre-stressed beam having a rectangular section 150 mm wide and 350 mm deep has an effective cover of 50 mm. If  $f_{ck} = 40 \text{ N/mm}^2$ ,  $f_p = 1600 \text{ N/mm}^2$  and area of pre-stressing steel,  $A_p = 461 \text{ mm}^2$ ; calculate the ultimate flexural strength of section.

15

- Q.7
- a) How does under-reinforced pre-stressed concrete section undergoes failure?
  - b) Explain different losses in pre-tensioned and post tensioned concrete.

6

9

**End Semester Examination, May 2017**  
**M. Tech. (Structure Engineering)–First Semester**  
**STRUCTURAL DYNAMICS (CM-S-102)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

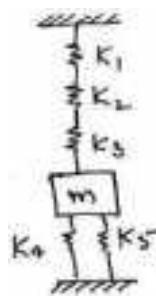
- Q.1 a) What is viscous damper?  
 b) Explain in brief Fourier series.  
 c) What are lumped mass concepts?  
 d) What are Laplace transformation?  
 e) Duhamel integral.

3 × 5

**PART-A**

- Q.2 a) What are the static loads in structure?  
 b) For the system below, find "m" such that has a natural frequency of 10 Hz.

5



$$K_1 = 2000 \text{ N/m}$$

$$K_2 = 1500 \text{ N/m}$$

$$K_3 = 3000 \text{ N/m}$$

$$K_4 = K_5 = 500 \text{ N/m}$$

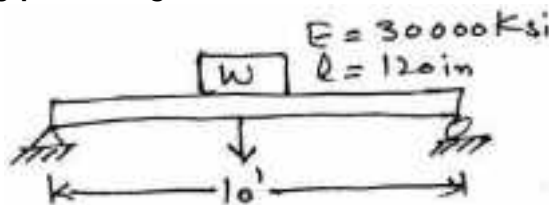
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- Q.3 Drive the equation of motion. What is critically damped system?

15

- Q.4 a) What is transmissibility?  
 b) A machine weight  $w = 3860 \text{ lb}$  as shown below produce a harmonic force of Magnitude  $F_0 = 7000 \text{ lb}$  and  $\bar{w} = 60 \text{ rad/sec}$ . Assume 10% critical damping determines:  
 i) Amplitude of machine.  
 ii) Force transmitted to beam support.  
 iii) Corresponding phase angle.

5

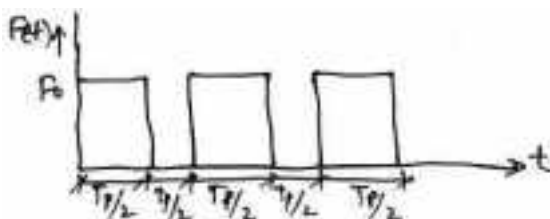


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**PART-B**

- Q.5 Derive the Fourier series expression for the given period of loading function. There are two phase in the given functions:

$$F(+)\begin{cases} F_0 & 0 \leq t \leq T_{p/2} \\ 0 & T_{p/2} \leq t \leq T_p \end{cases}$$



15

Q.6 Derive the following equation for Beat phenomenon.

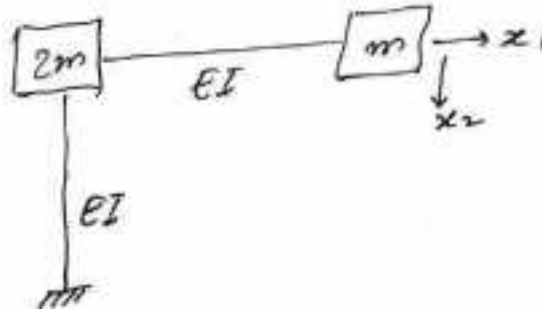
$$X = \sqrt{a^2 + b^2 + 2ab \cos \Delta \omega t}$$

15

Q.7 a) What are shear buildings?

5

b) Determine the natural frequencies and mode of vibration of the given system both the mass  $m$  and  $2m$  are contributing for the horizontal displacement.



10

**End Semester Examination, May 2017**  
**M. Tech. (Structure Engineering)–First Semester**  
**STRUCTURAL DYNAMICS (CM-S-102)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

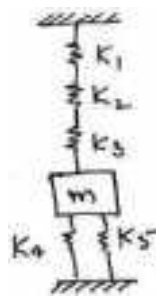
- Q.1 a) What is viscous damper?  
 b) Explain in brief Fourier series.  
 c) What are lumped mass concepts?

5 × 3

**PART-A**

- Q.2 a) What are the static loads in structure?  
 b) For the system below. Find "m" such that has a natural frequency of 10 Hz.

5



$$K_1 = 2000 \text{ N/m}$$

$$K_2 = 1500 \text{ N/m}$$

$$K_3 = 3000 \text{ N/m}$$

$$K_4 = K_5 = 500 \text{ N/m}$$

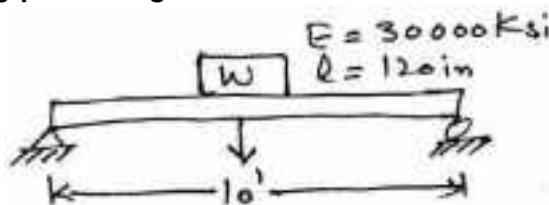
10

- Q.3 Drive the equation of motion. What is critically damped system?

15

- Q.4 a) What is transmissibility?  
 b) A machine weight  $w = 3860 \text{ lb}$  as shown below produce a harmonic force of Magnitude  $F_0 = 7000 \text{ lb}$  and  $\bar{w} = 60 \text{ rad/sec}$ . Assume 10% critical damping determines:  
 i) Amplitude of machine.  
 ii) Force transmitted to beam support.  
 iii) Corresponding phase angle.

5

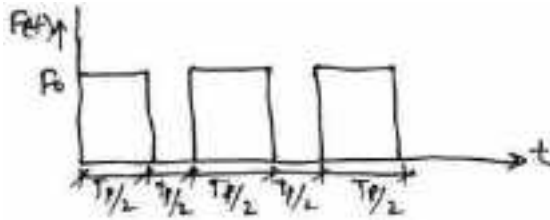


15

**PART-B**

- Q.5 Derive the Fourier series expression for the given period of loading function. There are two phase in the given functions:

$$F(+)\begin{cases} F_0 & 0 \leq t \leq T_{p/2} \\ 0 & T_{p/2} \leq t \leq T_p \end{cases}$$



15

Q.6 Derive the following equation for beat phenomenon.

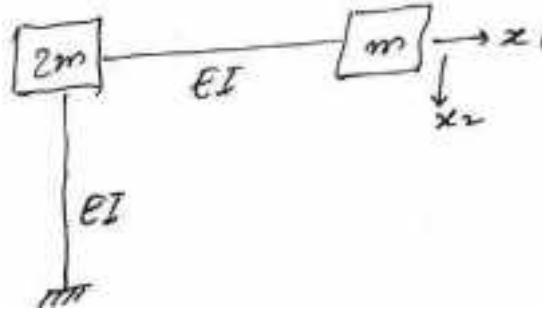
$$X = \sqrt{a^2 + b^2 + 2ab \cos \Delta \omega t}$$

15

Q.7 a) What are shear buildings?

5

b) Determine the natural frequencies and mode of vibration of the given system both the mass  $m$  and  $2m$  are contributing for the horizontal displacement.



15

**End Semester Examination, May 2017**  
**M. Tech. (Structural Engineering) - First Semester**  
**ADVANCED STRUCTURE ANALYSIS (C-MS-103)**

Time: 3 hrs

Max Marks: 75

No. of pages: 2

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

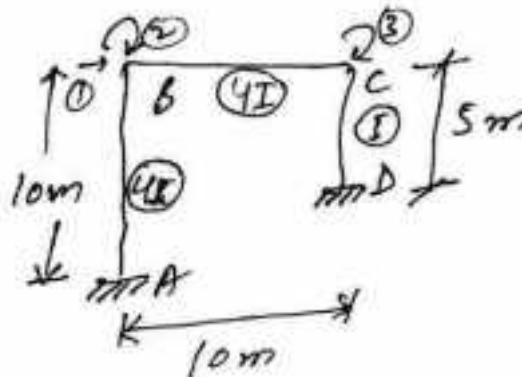
Q.1 Answer in brief:

- Explain grid element.
- Explain the Indeterminacy of structure.
- Principle of virtual work.
- Element stiffness of bar member.
- Stiffness method for plane frames.

3x5

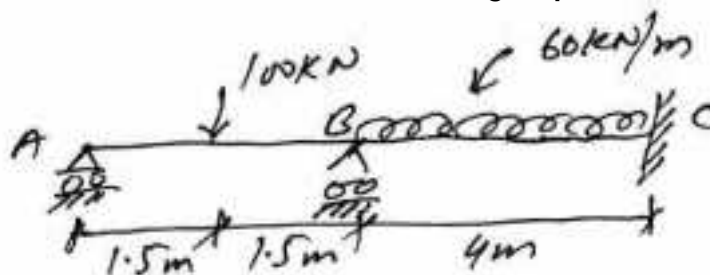
**PART-A**

Q.2 Develop the stiffness matrix for the portal frame ABCD with reference to the co-ordinate shown below:



15

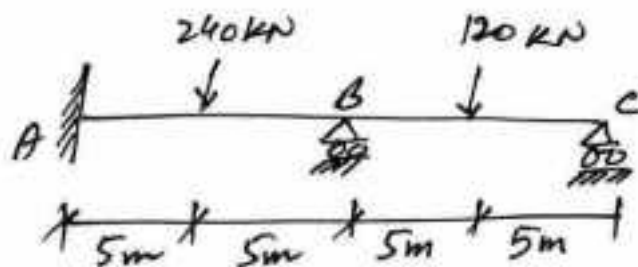
Q.3 Analyse the continuous beam shown below using displacement method:



EI Constant

15

Q.4 Analyse the Continuous Beam shown below, if the downward settlement of the support B and C is  $2000/EI$  and  $1000/EI$  in kN/m.



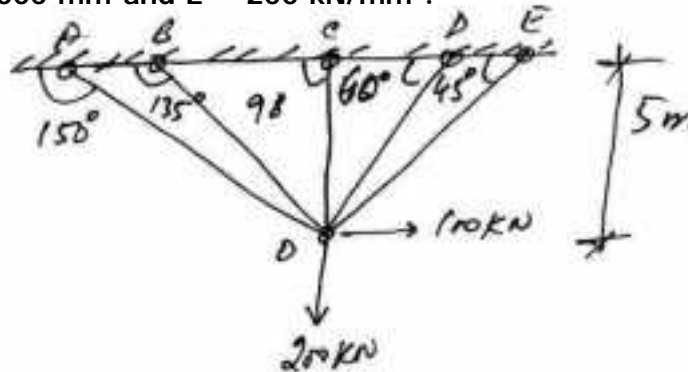
EI Constant

15

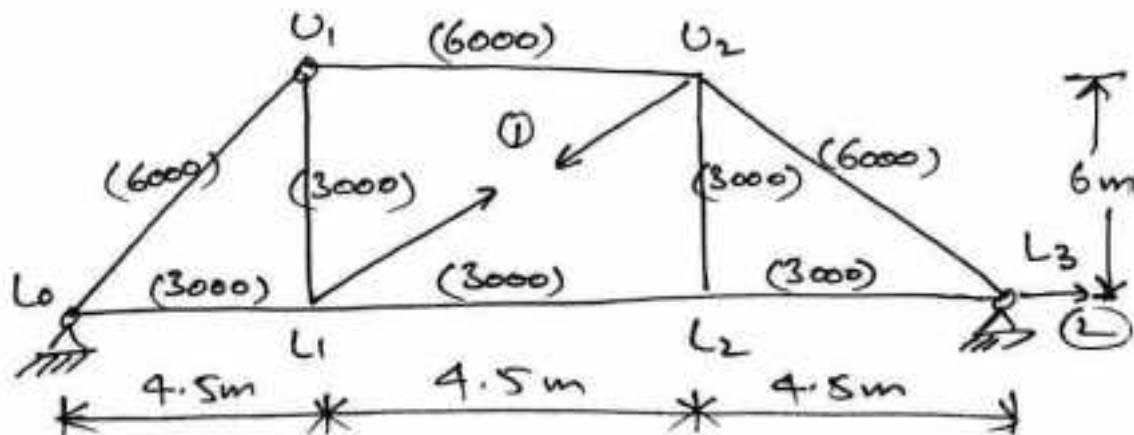


### PART-B

- Q.5 Write down the all stiffness coefficient of the Grid structure with a diagram. 15
- Q.6 Analyse the pin joint frame as shown in figure. The cross-sectional area of each member is  $2000 \text{ mm}^2$  and  $E = 200 \text{ kN/mm}^2$ .



- Q.7 Develop the flexibility matrix for the pin-joint plane frame with respect to co-ordinate 1 and 2 shown below. The numbers in parentheses are the cross-sectional areas of the members in  $\text{mm}^2$ .



15

**End Semester Examination, May 2017**  
**M. Tech. (Civil Engg.) - Second Semester**  
**STRUCTURAL RELIABILITY(CMS-106A)**

Time: 3 hrs

Max Marks:75

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Explain the following:

- a) Probability density function of failure.
- b) First order second moment methods.
- c) Bounds system of reliability.
- d) Optimal safety factors.
- e) Stochastic Load models.

3x5

**PART-A**

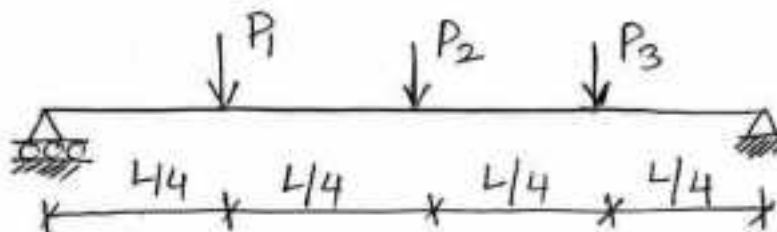
- Q.2 a) Explain probability theory. 5
- b) 100 specimens of TMT bar were selected randomly from a lot and tested for yield strength and ultimate strength. It is found that 20% of the samples have failed in yield strength, 25% in ultimate strength and 10% in both. As per codal provisions find the probability for the following:
- i) If specimen had failed against yield strength than probability of failure against ultimate strength.
  - ii) If specimen had failed against ultimate strength than probability of failure against yield strength.
  - iii) Probability of failure of specimen either against yield strength or against ultimate strength. 10

Q.3 A simply supported beam is subjected to loads  $P_1$ ,  $P_2$  and  $P_3$  as shown in figure-1 with given values as:

$$E(P_1) = 15 \text{ KN} \quad \text{Var}(P_1) = 1.5 \text{ KN}$$

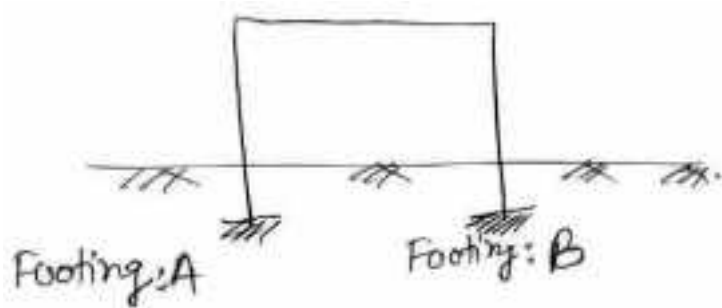
$$E(P_2) = 30 \text{ KN} \quad \text{Var}(P_2) = 3 \text{ KN}$$

$$E(P_3) = 50 \text{ KN} \quad \text{Var}(P_3) = 4 \text{ KN}$$



Determine the expected value and standard deviation of S.F at the left end if load  $P_1$ ,  $P_2$  and  $P_3$  are connected as  $\rho_{12} = 0.70$ ,  $\rho_{23} = 0.75$  and  $\rho_{31} = 0.68$  15

- Q.4 a) Explain Cornell Reliability Index. 4
- b) Define central limit theorem. 4
- c) Find the probability of differential settlement of a portal frame, if
- Probability of settlement of each footing = 0.1
  - Probability of each footing given the other one has settled = 0.8



7

### **PART-B**

- Q.5 A R.C.C. column is subjected to wind load as given distribution of log-normal with parameter LN (1000, 0.2). Determine the mean depth of the column at the limit state of deflection for a reliability of  $R_0 = 0.987$ .

$$\text{Allowable deflection} = \frac{\text{span}}{360},$$

$$E_c = (2.5 \times 10^4 \text{ N/mm}^2, 0.2)$$

15

- Q.6 Determine the reliability index for a tension member having tensile strength subjected to tensile load T. Given that:

$$\mu_R = 290 \text{ N/mm}^2, \quad \sigma_R = 26 \text{ N/mm}^2$$

$$\mu_Q = 4900 \text{ N}, \quad \sigma_Q = 1500 \text{ N}$$

$$\mu_D = 6 \text{ mm}, \quad \sigma_D = 0.6 \text{ mm}$$

Member is in circular shape.

15

- Q.7 a) Explain finite element structural reliability method analysis in brief.  
b) Explain time-variant reliability analysis based on stochastic process.

8

7

**End Semester Examination, May 2017**  
**M. Tech. (Civil Engineering)–First Semester**  
**CONCRETE ENGINEERING AND TECHNOLOGY (CMS-108)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Briefly explain the following:

- a) Role of  $C_2S$  and  $C_3S$  compounds of cement.
- b) Draw flow diagram for manufacture of cement by dry process.
- c) Explain C-type and F-type of pulverized fly ash.
- d) Explain workability and factors affecting workability.
- e) Use of epoxy coated rebars in coastal area.

3 × 5

**PART-A**

- Q.2 a) Discuss hydration mechanism and its products. 7  
 b) Write physical test conducted on cement and explain any two in details. 8

- Q.3 a) Why air entrained concrete is required? 3  
 b) What chemicals are used to create air bubbles in concrete? 3  
 c) Explain the advantages of using fly-ash, blast furnace slag and silica fume in the production of cement concrete. 9

Q.4 Design a M35 grade concrete mix with following data:

- a) Grade of cement: OPC 43 grade
- b) Maximum size of aggregate: 20 mm
- c) Minimum cement content: 320 kg/m<sup>3</sup>
- d) Maximum water cement ratio: 0.45
- e) Workability: 75 mm (stump)
- f) Exposure condition: very severe (for R.C.C)
- g) Method of placing: Pumping not used
- h) Degree of supervision: Very good
- i) Type of aggregate: Rounded
- j) Chemical admixture type: superplasticizer
- k) Mineral admixture type: Fly ash
- l) Specific gravity of cement: 3.15
- m) Specific gravity of fly ash: 2.30
- n) Specific gravity of fine and coarse aggregate: 2.70
- o) Water absorption and free (surface) moisture: Nil
- p) Fine aggregate: Zone II
- q) Coarse aggregate: Conforming to table-2 of IS:383

15

**PART-B**

- Q.5 a) Draw stress-strain curve for concrete and explain different types of modulus of elasticity. 7  
 b) Explain methods of finding tensile strength of concrete. 8
- Q.6 a) Explain creep in concrete and the factors affecting creep. 8  
 b) Explain platens effect in cube test in compression testing machine. 7

**Q.7** Write short notes on:

- a) Rapid hardening cement.
- b) Self-compacting concrete.
- c) Corrosion of steel.
- d) Test on hardened concrete.
- e) Non-destructive testing on concrete structure.

**3 × 5**

## End Semester Examination, May 2017

M. Tech.—First Semester

### ANALYSIS AND DESIGN OF TALL BUILDING STRUCTURES (C-MS-109)

Time: 3 hrs.

Max Marks: 75

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANY TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.

Q.1 Explain the following in brief:

- a) Effect of temperature in a tall building.
- b) Foundation for tall building.
- c) Permissible limit of horizontal drift in a tall building.
- d) Non-proportionate shear wall.
- e) Composite floor system.

3×5

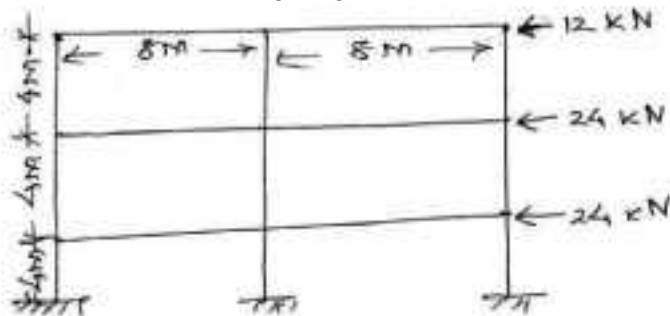
#### PART-A

Q.2 a) Explain the following:

- i) Tube in tube system.
- ii) Breast frame system.

2×2

b) Analyze the rigid frame shown below by any suitable method:



11

Q.3 a) Explain substitute frame method of analysis of rigid frame in detail.

7

b) Explain factor affecting growth height and structural form with graphs.

8

Q.4 a) Discuss and explain different types of shear walls.

5

b) Explain any approximate method of analysis of proportionate type of shear wall.

10

#### PART-B

Q.5 a) How does the settlement of foundation effect a tall building?

7

b) Discuss in detail soil structure interaction in design aspect of foundation for tall buildings.

8

Q.6 Find story drift for the frame shown in question 2(b) by approximate method. Assume size of all beams as 300mm. × 650mm. and size of all columns as 450mm. × 450mm. Consider M 30 grade concrete and Fe 415 grade steel.

15

Q.7 Write short notes on:

- a) Floor system for a tall building.
- b) Structural system for a tall building.
- c) Modern methods for analysis and design of a tall building.

3×5

**End Semester Examination, May 2017**  
**M. Tech. - Second Semester**  
**FINITE ELEMENT METHOD (C-MS-202)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANY TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Write short notes on the following:

- a) Galerkin formulations.
- b) Plane strain problem.
- c) Elements aspect ratio.
- d) Two-dimensional beam element.
- e) Non linearity in structures.

3 × 5

**PART-A**

Q.2

- a) What are the convergence and compatibility requirement?
- b) Explain principle of minimum potential energy.
- c) What is natural co-ordinate system? Give the expression for a linear model for triangular element.

5 × 3

Q.3

- a) Construct the interpolation function for (natural) co-ordinates for quadratic displacement variation for plane stress-strain elements with nodes at the vertices and mid points of the sides.
- b) Explain different types of refinements in detail.

8

7

Q.4

- a) Check whether the following displacement function use for a finite element is compatible and complete:

$$u = \alpha_1 + \alpha_2 x + \alpha_3 y + \alpha_4 x^2 + \alpha_5 xy + \alpha_6 y^2.$$

8

b) Explain the basic steps involves in finite element methods.

7

**PART-B**

Q.5

- a) Write down the concept of the adaptive method. Explain flow chart for adaptive mesh method. Define the regular and irregular meshes with the neat sketches.
- b) Explain non-linear normal model.

8

7

Q.6 Define 'material non-linearity'. Show non-linear elastic model, strain energy density, elastic-plastic model, yield surface and post yielding behavior.

15

Q.7

- a) Explain general linear system with Eigen values for the saddle, stable, stable spiral linear cases.
- b) Write short notes on:
  - i) Heat generation.
  - ii) Four noded shell element for cooling tower.
  - iii) Orthotropic thermal conductivity.

9

2 × 3

**End Semester Examination, May 2017**  
**M. Tech.— Second Semester**  
**FINITE ELEMENT METHOD (C-MS-202)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 1

Note: *Attempt FIVE questions in all; Q. 1 is compulsory. Attempt ANY TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Write short notes on:

- a) Galerkin formulations.
- b) Plane strain problem.
- c) Elements aspect ratio.
- d) Two-dimensional beam element.
- e) Non linearity in structures.

3 × 5

**PART-A**

- Q.2
- a) What are the convergence and compatibility requirement?
  - b) Explain principle of minimum potential energy.
  - c) What is natural co-ordinate system give the expression for a linear model for triangular element?
- 5 × 3
- Q.3
- a) Construct the interpolation function for (natural) co-ordinates for quadratic displacement variation for plane stress-strain elements with nodes at the vertices and mid points of the sides.
  - b) Explain different types of refinement.
- 8  
7
- Q.4
- a) Check whether the following displacement function use for a finite element is compatible and complete.  $u = \alpha_1 + \alpha_2 x + \alpha_3 y + \alpha_4 x^2 + \alpha_5 xy + \alpha_6 y^2$ .
  - b) Explain the basic steps involves in finite element methods.
- 8  
7

**PART-B**

- Q.5
- a) Write down the concept of the adaptive method. Explain flow chart for adaptive mesh method. Define the regular and irregular meshes with the neat sketches.
  - b) Explain non-linear normal model.
- 8  
7
- Q.6
- Define material non-linearity. Show non-linear elastic model, strain energy density, elastic-plastic model, yield surface and post yielding behavior.
- 15
- Q.7
- a) Explain general linear system with Eigen values for the saddle, stable, stable spiral linear cases.
  - b) Write short notes on:
    - i) Heat generation.
    - ii) Four noded shell element for cooling tower.
    - iii) Orthotropic thermal conductivity.
- 8  
3 × 3



**End Semester Examination, May 2017**  
**M. Tech. (Structural Engineering)–Second Semester**  
**FINITE ELEMENT METHOD (C-MS-202)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

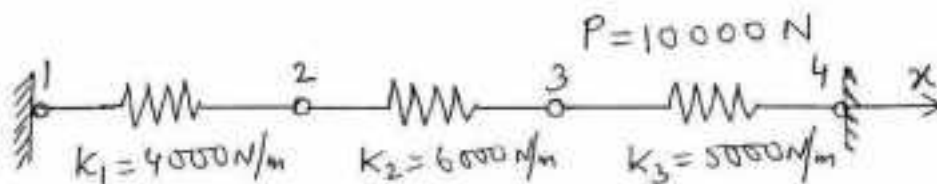
Q.1 Explain in brief:

- a) Galerkin's formulations.
- b) Plain stress problem
- c) LST element.
- d) Displacement function.
- e) Higher order elements.

3 × 5

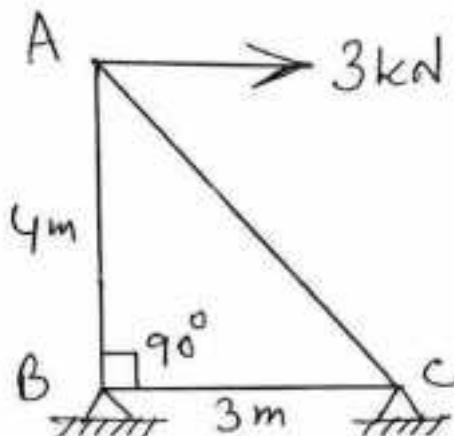
**PART-A**

Q.2 Determine the overall stiffness matrix for the system shown in the figure:



15

Q.3 Analyze the plane truss as shown in the figure. AE is constant.



15

Q.4 Derive the stiffness matrix for CST element.

15

**PART-B**

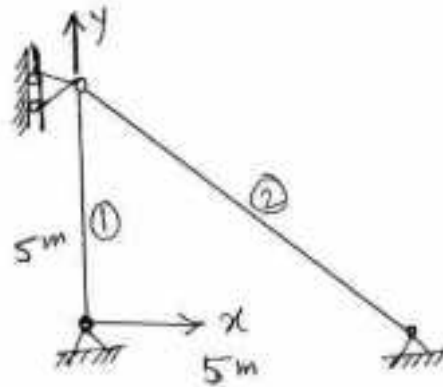
Q.5 Explain in brief:

- a)  $h$  and  $p$  methods of refinement.
- b) IIL conditioned elements.
- c) Auto and adaptive Mesh Generation Techniques.

5 × 3

- Q.6
- a) When material and geometric nonlinearity are considered in the analysis of structures? Give some examples. 5
  - b) Write a short note on dynamic condensation technique. 5
  - c) Discuss briefly about given value and Eigen vector. 5

- Q.7 Determine the displacements at node 1 and the axial stresses in each bar as shown in the figure. The bars are subjected to a temperature rise of  $30^{\circ}\text{C}$ .  $E = 2 \times 10^5 \text{ N/mm}^2$ , coefficient of thermal expansion,  $\alpha = 11 \times 10^{-6}/^{\circ}\text{C}$ . Area of each bar =  $60\text{cm}^2$ .



**End Semester Examination, May 2017**  
**M. Tech. (Structural Engineering)–Second Semester**  
**SEISMIC ANALYSIS AND DESIGN OF STRUCTURES (CMS-203)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

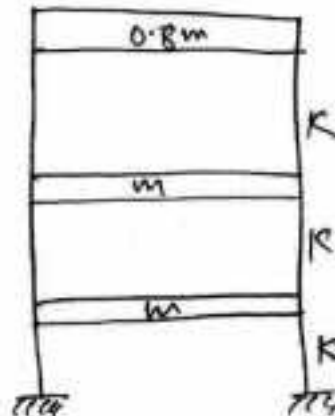
Q.1 Answer in brief:

- a) What are surface waves?
- b) What are seismograms?
- c) State two factors affecting liquefaction.
- d) What is damping?
- e) What is soft storey?
- f) What is storey drift?
- g) What is grouting in masonry wall?
- h) Draw box action of wall.
- i) What is ductility?
- j) What are confining reinforcement?

2 × 10

**PART-A**

- Q.2 a) Explain plate tectonic theory and its mechanism. 7½  
 b) How is the assignment of an earthquake's magnitude based? What is the difference between magnitude and intensity? 7½
- Q.3 a) Discuss how soil structures interact during an earthquake. 7½  
 b) Write short notes on:  
     i) Dynamic property of soil.  
     ii) Liquefaction. 7½
- Q.4 Determine natural frequency and mode shape of 3-storied single frame. The mass is lumped at floor level of magnitude 'm' except at top of '0.8m'. The stiffness of a floor level is K. Assume K = 50 kN/m.

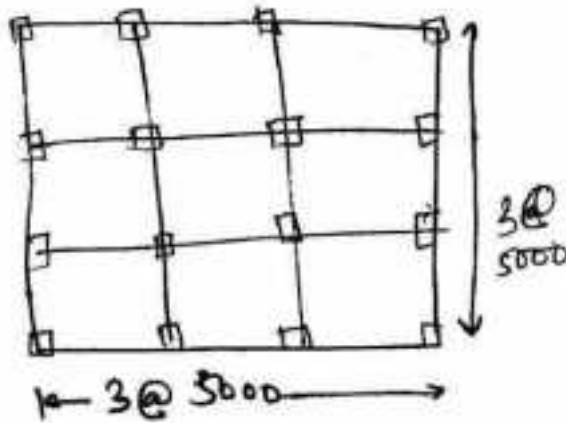


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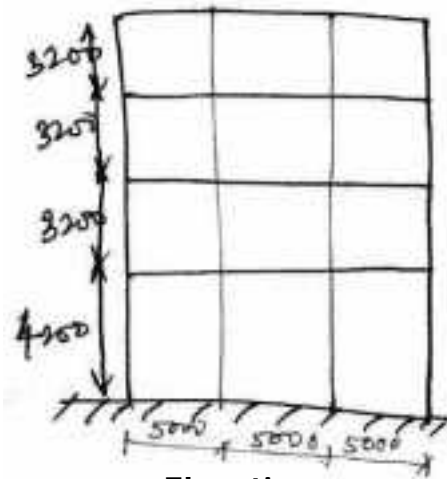
**PART-B**

- Q.5 Consider a four storey reinforced concrete office building. The building is located in shillong (Zone-V). The soil conditions are medium stiff and the building is located on raft foundation. The RC frames are infilled with brick masonry. The lumped weight due to dead load is 12 kN/m<sup>2</sup> on floor and 10 kN/m<sup>2</sup> on roof. The floors are to cater for

a live load of  $4 \text{ kN/m}^2$  on floor and  $1.5 \text{ kN/m}^2$  on roof. Determine design and seismic load on structure by equivalent static method.



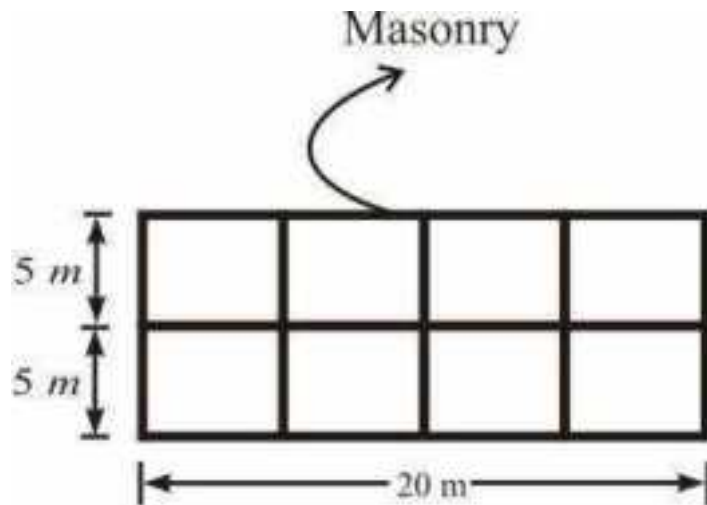
PLAN



Elevation

15

- Q.6 a) Determine the lateral forces on a two storey unreinforced brick masonry building, situated near Indore (Zone-III), soil type is medium. Plan size  $20\text{m} \times 10\text{m}$ , storey height  $3\text{m}$ . Weight of roof =  $2.5 \text{ kN/m}^2$  weight of wall =  $5 \text{ kN/m}^2$ , live load on floor =  $1 \text{ kN/m}^2$ .



PLAN

10

- b) Detail horizontal band in masonry building.

5

- Q.7 Design the reinforcement for a column of size  $450\text{mm} \times 450\text{mm}$ , unsupported length of  $3 \text{ m}$ . Use M25 grade concrete and Fe415 grade steel. Column is braced against side sway in both directions.

	Dead load	Live load	Seismic load
Axial Load (kN)	1100	700	500
Moment (kNm)	70	60	150

15

**End Semester Examination, May 2017**  
**M. Tech.–SecondSemester**  
**THEORY OF PLATES AND SHELLS (C-MS-204)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) What do you mean by thin plates and thick plates?
  - b) Write the assumptions made for the analysis of thin plates with small deflection.
  - c) What do you mean by anticlastic surface? Give an example.
  - d) Write the formula for flexural rigidity of plates and explain the terms.
  - e) Give the boundary conditions for a built-in edge.
  - f) Write down the advantage of Levi's approach over Navier's approach.
  - g) Write down the differential equation for bending of a circular plate under a lateral load.
  - h) Define 'surface of revolution'.
  - i) Define 'meridian' and 'meridian plane' in a surface of revolution.
  - j) Define 'discontinuity stresses' in a pressure vessel.
- 1½ × 10

**PART-A**

- Q.2 Derive the equation for cylindrical bending of uniformly loaded rectangular plate with simply supported edges. 15
- Q.3 Derive the equation for slope and deflection of an uniformly loaded circular plate with fixed boundary edges. 15
- Q.4 Derive the Navier solution for the deflection of a simply supported square plate subjected to point load. 15

**PART-B**

- Q.5 Derive the differential equation for bending of anisotropic plates. 15
- Q.6
- a) Discuss the classification of shells with sketches. 10
  - b) Differentiate between membrane theory and bending theory of shells. 5
- Q.7 Derive the equation for deflection of a circular cylindrical shell loaded symmetrically with respect to its axis. 15

**End Semester Examination, May 2017**  
**M. Tech.— Second Semester**  
**ADVANCE DESIGN OF R.C.C. STRUCTURES (C-MS-208)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANY TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Write short notes on:

- a) Axial force moment interaction curve.
- b) Working stress method and limit state method.
- c) Structural action of folded plate.
- d) Stress due to self-weight and wind load on the shaft.
- e) Classification of R.C.C. pipes.

3 × 5

**PART-A**

- Q.2 a) Find moment of resistance of a rectangular beam of size 200 mm x 400 mm and 400 mm x 200 mm reinforced with 3-bars of 16 mm diameter on tension side only. Consider M20 grade concrete and Fe500 grade steel. Comment about orientation of beam in the structure. 7
- b) Design longitudinal reinforcement for a ring beam of size 500mm x 700mm subjected to a bending moment of 200 KN-M, twisting moment of 15 KN-M and a shear force of 150 KN at ultimate. Use M20 grade concrete and Fe415 grade steel. 8

Q.3 Design a slender braced circular column under uniaxial bending with the following:

Size of column = 40 cm.

Concrete grade = M20.

Steel grade = Fe415.

Effective length = 4.5 m., Unsupported length = 5 m.

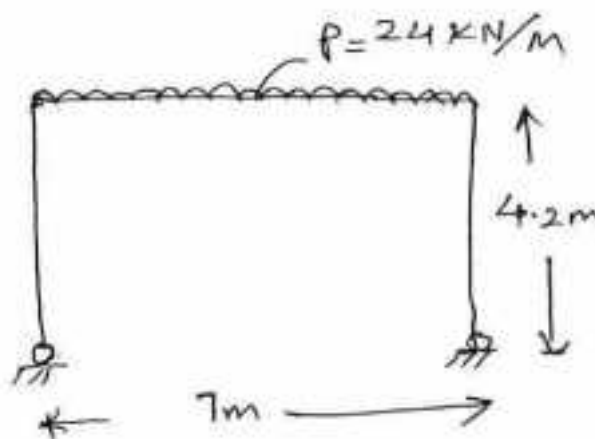
Factored load  $P_u = 1200$  KN.

Factored moment  $M_{ux} = 75$  KNm. at top, 50 KNm. at bottom.

The column is bent in single curvature.

15

Q.4 Design Beam of R.C.C. portal frame shown in the figure below with the following data:



Thickness of slab = 125 mm.

Clear span between support = 7.0 m.

Spacing of continuous beam = 3m 4c.

Imposed load = 24 kN/m.

Grade of concrete = M25.

Grade of steel = Fe415.

15

**PART-B**

- Q.5 A reinforced concrete coffered floor is to be designed to cover a floor area size of 16 m. × 16 m. The spacing of the ribs in mutually perpendicular direction is 2m centre-to-centre. Imposed load = 4 kN/m<sup>2</sup>. Assume M30 grade concrete and Fe415 grade steel. Design the suitable reinforcement. 15
- Q.6 A reinforced concrete pressure pipe is designed to with stand a working pressure of 0.3 N/mm<sup>2</sup>. The internal diameter of the pipe is 900 mm. and length of the pipe is 3.5 m. Design the pipe and sketch the details of reinforcement. Adopt M30 grade concrete and hard drawn steel wire conforming to IS: 432-1982. 15
- Q.7 a) Explain different types of folded plates with sketches. 7  
b) Explain the method of analysis of folded plate by beam method. 8

**End Semester Examination, May 2017**  
**M. Tech. (Construction Management) - Second Semester**  
**NUMERICAL METHODS IN CIVIL ENGINEERING (C-MS-209)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

- Q.1** a) Solve the following system by Gauss-elimination method,  
 $x + 2y + 3z = 10$   
 $x + 3y - 2z = 7$   
 $2x - y + z = 5$  **7**
- b) Apply Gauss Seidel iteration-elimination method, to solve the equations,  
 $20x_1 + 5x_2 - 2x_3 = 14$   
 $3x_1 + 10x_2 + x_3 = 17$   
 $x_1 - 4x_2 + 10x_3 = 23$  **8**
- Q.2** a) Using Regula-Falsi method, find a root of  $x^3 + 2x - 2 = 0$ , correct up to four significant figures. **7**
- b) Find one positive root of the equation  $x^3 + 3x - 1.06 = 0$ , using Bisection method, correct to three decimal places. **8**
- Q.3** The values of  $f(x)$  given below are of a polynomial of degree four. Find  $f(x)$  and  $f(5)$ .
- |         |   |    |    |    |
|---------|---|----|----|----|
| $x:$    | 2 | 4  | 6  | 8  |
| $f(x):$ | 5 | 10 | 17 | 29 |
- 15**
- Q.4** Compute  $f'(1.5)$  and  $f''(1.5)$ , from the given table:
- |         |        |        |        |        |        |
|---------|--------|--------|--------|--------|--------|
| $x:$    | 1.1    | 1.2    | 1.3    | 1.4    | 1.5    |
| $f(x):$ | 2.0091 | 2.0333 | 2.0692 | 2.1143 | 2.1667 |
- 15**
- Q.5** Compute  $y(0.2)$  from the equation  $dy/dx = x + y^2$ ,  $y(0) = 1$  and  $h = 0.2$ , by Runge-Kutta method correct to four decimal places. **15**
- Q.6** Find  $y(1)$ , by Euler's method, from the differential equation  $dy/dx = -y/(1+x)$  when  $y(0.3) = 2$ , correct upto 4 decimal, taking step length  $h = 0.1$ . **15**
- Q.7** Solve the following LPP problem by graphical method:  
 Minimize:  $z = 3x_1 + 2x_2$   
 Subject to the constraints:  
 a)  $5x_1 + x_2 \geq 10$   
 b)  $x_1 + x_2 \geq 6$   
 c)  $x_1 + 4x_2 \geq 12$   
 d)  $x_1, x_2 \geq 0$  **15**



**End Semester Examination, May 2017**  
**M. Tech.(Transportation Engg.) —SecondSemester**  
**GEOGRAPHIC INFORMATION SYSTEM (C-MT-106)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1 a) Define 'GIS'.  
 b) What do you understand by spatial and temporal information?  
 c) Describe map projection system.  
 d) Explain digitization.  
 e) Explain the term map overlay.  
 f) What is attribute data?  
 g) Define the term remote sensing?  
 h) What is metadata?  
 i) What is a digital image?  
 j) Define 'DBMS'.

1½ × 10

**PART-A**

- Q.2 a) What are components of GIS?  
 b) Explain the applications of GIS as a decision support system.  
 c) Explain why layers are used in GIS.

5 × 3

- Q.3 Explain the following:  
 a) Data source in GIS.  
 b) Raster data format.  
 c) Vector data format.

5 × 3

- Q.4 Write a note on coordinate system. What are different types of map projection systems?

15

**PART-B**

- Q.5 Discuss the error likely to be encountered during the execution of a GIS project. 15

- Q.6 Write short notes on:

- a) Digital elevation models.  
 b) Integration of remote sensing, GIS and GPS.

7½ × 2

- Q.7 Discuss the applications of GIS in transportation engineering. Also give the basic steps to develop GIS of a project. 15

**End Semester Examination, May 2017**  
**M. Tech.—Second Semester**  
**DESIGN AND MAINTENANCE OF PAVEMENTS (C-MT-201)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

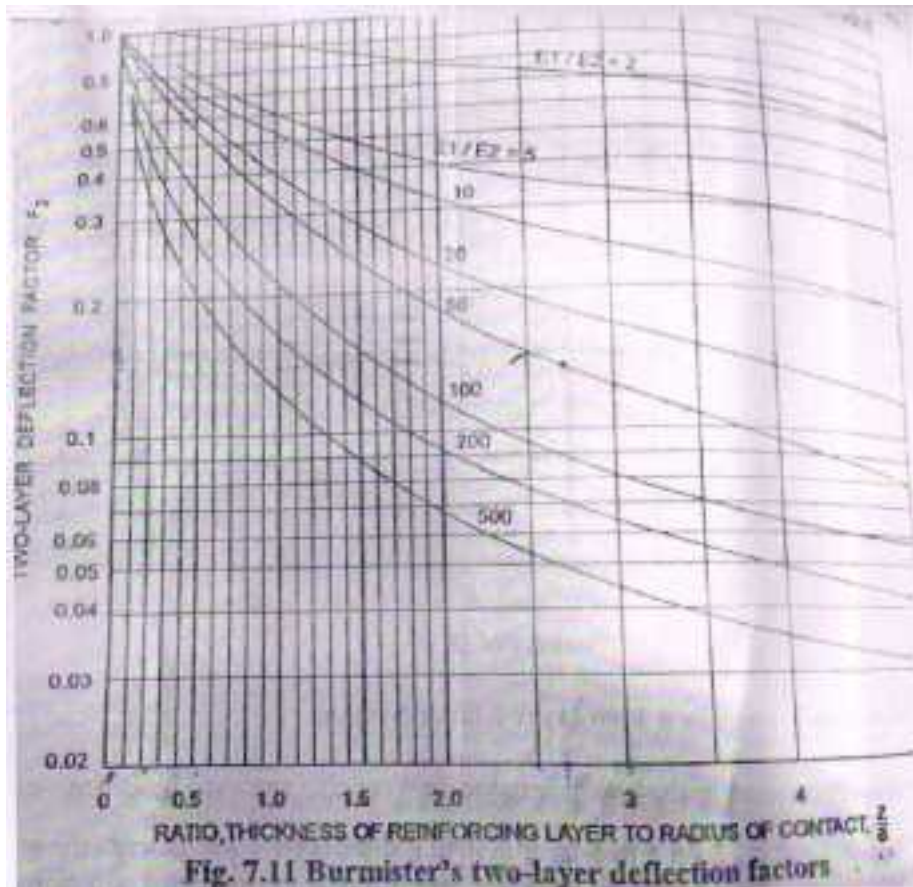
- Q.1
- a) Briefly explain the causes and effects of moisture content and temperature in flexible pavements.
  - b) Explain the functions of sub-base course of flexible pavement in brief.
  - c) Explain ESWL and the concept in the determination of equivalent load.
  - d) What are the types and causes of pavement deterioration?
  - e) Discuss the advantages of CBR method of design.
  - f) Give the Burmister's equation for modulus of elasticity of subgrade with flexible and rigid bearing plate.
  - g) Discuss Westergaard's concept of temperature stresses in concrete pavements in brief.
  - h) Calculate the radius of relative stiffness of 15 cm. thick cement concrete slab using the following data-modulus of elasticity of cement concrete =  $2.1 \times 10^5 \text{ kg/cm}^2$ , Poisson's ratio of concrete = 0.15, modulus of subgrade reaction,  $K = 3.5 \text{ kg/cm}^3$ .
  - i) What is the object of pavement evaluation?
  - j) Explain the effects of soil properties on other components of pavement structure.
- $1\frac{1}{2} \times 10$

**PART-A**

- Q.2 Explain the various functions of components of flexible pavement with neat sketches. 15
- Q.3
- a) Discuss the effects of repeated application of loads on pavements. Explain equivalent wheel load factors for repetition of different loads. 8
  - b) The traffic studies and axle load distribution studies carried out during project preparation indicated that there are i) 9800 vehicles per day with rear axle load in the range of 2500 to 3500 kg. and growth rate of 7.0% p.a. and ii) 2800 heavy vehicles with rear axle load in the range of 11,000 to 13,000 kg and growth rate of 4.0%. The road pavement is expected to be constructed in a period of 4.0 years after this study and the flexible pavement structure is to be designed for a life of 15 years. Determine value of CSA for design. 7
- Q.4
- a) List the various structural requirements for flexible pavements. 7
  - b) Briefly explain Benkelman beam rebound deflection test. 8

**PART-B**

- Q.5
- a) A plate bearing test conducted with a 300 mm diameter plate on a subgrade yielded a pressure of  $1.2 \text{ kg/cm}^2$  at 0.5 cm. deflection. The test when carried out on a base course of thickness 20 cm yielded a pressure of  $7.5 \text{ kg/cm}^2$  at 0.5 cm deflection. Design the thickness of pavement for a wheel load of 6500 kg with a tyre pressure of  $8.0 \text{ kg/cm}^2$  for an allowable deflection of 0.5 cm. using Burmister's two-layer deflection factor chart.



b) Classify the various design methods for flexible pavements.

10  
5

- Q.6 a) Classify the different types of joints in CC pavements and mention the objects of each. 10
- b) What are the objects of providing dowel bars in CC pavements? 5
- Q.7 What are the different types of overlays that may be considered for strengthening of existing flexible pavements? Mention their relative advantages. 15

**End Semester Examination, May 2017**  
**M. Tech. (Transportation Engineering)– Second Semester**  
**GEOMETRIC DESIGN OF STREETS AND HIGHWAY (C-MT-202)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) What are the parameters of a normally distributed curve? Write down the probability function of the same.
  - b) An ascending gradient 1 in 60 meets a descending gradient of 1 in 50. Find the length of vertical summit curve for a SSD of 180m.
  - c) What are traffic separators? Write down the main function of these.
  - d) What are the different types of intersections?
  - e) What do you understand by LOS?
  - f) Define 'pin bends' with a diagram.
  - g) Calculate the length of transition curve when speed=80 km/hr and radius of circular curve=150 m.
  - h) Explain overtaking sight distance.
  - i) Define 'potential conflict points of intersection'.
  - j) Name the different types of cross-section elements.
- 1½ × 10

**PART-A**

- Q.2 What are the factors affecting design criteria for a rural and urban road? 15
- Q.3 An expressway four lane divided, passing through a flat terrain has a horizontal curve of radius equal to ruling minimum radius. If the design speed is 120 Km/hr. Calculate:
- a) Ruling minimum radius.
  - b) Super-elevation.
  - c) Extra widening.
  - d) Length of transition curve.
- Assume any other data if required as per IRC. 15
- Q.4
- a) What are the factors that effect friction? Also write down the expression for frictional force. 5
  - b) Define the following terms:
    - i) Width of carriageway.
    - ii) Cross-fall.
    - iii) Right of way.
    - iv) Frontage roads.
    - v) Unevenness. 2x5

**PART-B**

- Q.5
- a) A radar unit is used to measure speeds of cars on a motorway. The speeds are normally distributed with a mean of 90 Km/hr and a standard deviation of 10 Km/hr. What is the probability that a car picked at random is travelling at more than 100 Km/hr? 5
  - b) A sample of size  $n = 100$ , produced the sample mean of 16. Assuming the population standard deviation as 3, compute a 95% confidence interval for the population mean. 10

- Q.6 A road intersection has five legs designated as 1, 2, 3, 4 and 5. Leg 1 is in N-S direction and others are marked clockwise. The traffic volumes in terms of PCU ( $V_{ij}$ ) per hour during peak period are given below:

$V_{12}$	37	$V_{31}$	466	$V_{41}$	182	$V_{51}$	45
$V_{13}$	303	$V_{32}$	122	$V_{42}$	54	$V_{52}$	132
$V_{14}$	64	$V_{33}$	47	$V_{43}$	18	$V_{53}$	62
$V_{15}$	52	$V_{34}$	657	$V_{44}$	116	$V_{54}$	15

Find the weaving ratio between the legs 1 and 2.

15

- Q.7 a) What are the two basic types of parking facilities? Differentiate between them using proper diagram. 10
- b) What are channelizing islands? Draw a channelizing island showing the proper movement. 5

**End Semester Examination, May 2017**  
**M. Tech.(Transportation Engineering) –Second Semester**  
**PAVEMENT MAINTENANCE AND MANAGEMENT SYSTEM (C-MT-203)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1    a) What do you understand by skid resistance?  
        b) How is FWD better than Benkelman Beam for NDT?  
        c) Show the behaviour of skid friction with increase of annual daily traffic.  
        d) What do you understand by back-calculation technique?  
        e) Explain: PSI and PSR. 3 × 5

**PART-A**

- Q.2    a) Write down the main objectives behind the formation of Pavement management system. 5  
        b) What are the various components of a PMS? 10
- Q.3    What are the various distress in flexible and rigid pavement and how will you identify them? 15
- Q.4    a) Write down the advantages and disadvantages of Benkelman beam over Dynaflect. 5  
        b) What are the different corrections applied on the measured deflection using Benkelman beam? Write the expressions as well. 10

**PART-B**

- Q.5    a) What are the factors contributing to roughness? 10  
        b) How will you measure roughness? Explain the measuring system. 5
- Q.6    Explain the various NDT equipment used for flexible pavement evaluation. 15
- Q.7    a) Write down the factors affecting skid resistance. Use proper graph to explain the same. 10  
        b) Briefly explain the friction measurement methods. 5

**End Semester Examination, May 2017**  
**M. Tech. (Construction Management)–Second Semester**  
**ENVIRONMENTAL IMPACT-ASSESSMENT (C-MT-302)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1 Briefly answer the following:
- What all components are broadly considered in EIA?
  - On what factors does duration of EIA hinge?
  - Give the validity period of environmental clearance for river valley and mining projects.
  - List any three projects requiring clearance of EIA.
  - Expand CPCB, MoEFCC and PWD.
  - What is ambient noise level?
  - Explain various sources of noise.
  - List a few objectives of public participation.
  - List various negotiation procedures involved in meeting of disputants.
  - Define a sustainable road.
- 1½ × 10

**PART-A**

- Q.2
- Define and briefly discuss EIA. 5
  - Discuss the salient features of NEPA. 5
  - Describe the significance of consideration of alternative in EIA study. 5
- Q.3
- Explain the conceptual principle of EIA and its sub-components. 6
  - Give an overview of environmental clearance procedure practiced in India. 4
  - Discuss the social and environmental impact on construction of dam in rural. 5
- Q.4
- Discuss the environmental impacts of roads and highway projects. 5
  - What criterias are considered in selecting the alignment of highway projects in context of EIA? 5
  - Discuss the grossing and planting requirements considered in view of IRC-104-1988. 5

**PART-B**

- Q.5
- Discuss various noise control measures adopted at source. 6
  - Describe the methods of environmental impact assessment. 9
- Q.6
- Describe the procedure of public consultation. 7
  - Discuss various techniques considered for selection of public participation. 8
- Q.7
- Define environmental management. 5
  - Identify and explain the main barriers to environmental management. 5
  - Explain the importance of information and knowledge for environmental management. 5

**End Semester Examination, May 2017**  
**B. Tech.–FirstSemester**  
**ELEMENTS OF COMPUTER AND PROGRAMMING (CS-101)**

Time: 3 hrs.

Max Marks:100

No. of pages:1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

- Q.1
- a) Define 'flowchart with example'.
  - b) Differentiate between 1D and 2D array.
  - c) What do you understand by function prototype?
  - d) Give syntax of loop with example.
  - e) Differentiate between '\*' and '\$'.
  - f) Define 'Enum'.
  - g) What do you understand by ASCII code?
  - h) Difference between getchar( ) and putchar( ).
  - i) Why do we use loops in C programming?
  - j) What is computer system?
- 2 × 10

**PART-A**

- Q.2
- a) What is CPU? Explain its functions. 5
  - b) Define 'operating system'. Give different functions of operating system. 5
  - c) Convert:
    - i)  $(11100101)_2 \rightarrow ( )_{10}$
    - ii)  $(721)_8 \rightarrow ( )_{10}$
    - iii)  $(101111100001)_2 \rightarrow ( )_{16}$
    - iv)  $(1111 \times 110)_2 \rightarrow ( )_2$
    - v) Find 2's complement of  $(35)_{10}$ . 2 × 5
- Q.3
- a) Write an algorithm for a problem in which N numbers are read and it is desired to pick the largest of them. 10
  - b) Differentiate between the following:
    - i) Algorithm and flowchart.
    - ii) Assembly language and machine language.
    - iii) Linker and loader.
    - iv) Compiler and Interpreter. 2½ × 4
- Q.4
- a) Define 'array'. Write a program to print addition of two matrices. 10
  - b) Differentiate between while( ) and dowhile( ) loop. Write a program to find whether a give number is odd or even. 10

**PART-B**

- Q.5
- a) Write a program to print fibonacci series using recursion. 10
  - b) Write a program to print price, pages and title of three books using structures. 10
- Q.6
- a) Explain various string handling functions. 10
  - b) Explain call by value and call by reference with example. 10
- Q.7
- a) Write short notes on:
    - i) Preprocessor directives.
    - ii) User defined Header files. 5 × 2



b) Write a program to copy content of one file to another file.

10

**End Semester Examination, May 2017**  
**B. Tech.–First Semester**  
**INTRODUCTION TO COMPUTER SYSTEM(CS-102A)**

Time: 3 hrs

Max Marks:100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1 a) Differentiate between 'intranet' and 'internet'.  
 b) Define the term: 'BIOS'.  
 c) What is a hexadecimal number system?  
 d) What is secondary storage?  
 e) Explain working of hub.  
 f) Define 'assembler'.  
 g) What do you mean by network security?  
 h) List the advantages of high level languages.  
 i) Explain time sharing.  
 j) Define printer and list its types. 2x10
- PART-A**
- Q.2 a) Name and explain various types of computers and its generation. 10  
 b) Convert the following:  
     (i)  $(658.38)_{10} = (?)_2$   
     (ii)  $(AED)_{16} = (?)_{10}$   
     (iii)  $(5437)_8 = (?)_{16}$   
     (iv)  $(7935)_{10} = (?)_{16}$   
     (v)  $(1011011.101)_2 = (?)_{10}$  2x5
- Q.3 a) Explain memory hierarchy with their advantages and disadvantages. 10  
 b) Differentiate between 'static' and 'dynamic RAM'. 5  
 c) Write short notes on:  
     i) Central processing unit (CPU)      ii) Cache Memory. 5
- Q.4 a) What are the fundamental components of an operating system? Explain in brief. 10  
 b) Discuss the advantages and disadvantages of multiprogramming. 5  
 c) What is UNIX operating system? Compare it with Window operating system. 5
- PART-B**
- Q.5 a) Differentiate between 'machine language' and 'assembly language' with their advantages and disadvantages. 6  
 b) Explain the working principle of the following terms in the programming language.  
     i) Assembler    ii) Compiler    iii) Interpreter    iv) Linker    v) Loader 2x5  
 c) Write a short note on 'system software'. 4
- Q.6 a) Write an explanatory note on network topology and its types. 8  
 b) List the various devices used in networking. Also, explain their advantages and disadvantages. 8  
 c) Explain how wired network is different from wireless network? 4
- Q.7 a) Differentiate between 'Hacker' and 'Cracker'. 5

**b) Write short notes on the following terms:**

- i) Worm      ii) Trojan horse      iii) Virus      iv) Firewall      v) Cookie

**3x5**

**End Semester Examination, May 2017**  
**B. Tech.—First / Second Semester**  
**PROGRAMMING IN C (CS-103)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) Difference between variable and constant.
  - b) Define array and declare an array of integers.
  - c) Write two advantages of using functions in C.
  - d) Differentiate between structure and union in C.
  - e) What is a pointer? Declare an integer pointer.
  - f) Explain user-defined data type.
  - g) What is a stream?
  - h) Explain any two functions:
    - i) fseek().
    - ii) fwrite().
    - iii) fopen().
  - i) What are the advantages of using loops in C?
  - j) How do you compare two strings using string handling function? 2 × 10

**PART-A**

- Q.2
- a) Explain the difference between while and do-while loop with the help of a program. 10
  - b) Explain the different types of operators in C. 10
- Q.3
- a) Write a program for matrix multiplication in C. 10
  - b) Explain various string handling functions in C. 10
- Q.4
- a) Explain structure with in structure i.e. nested structure with the help of syntax. 8
  - b) Write a C program using array of structures to create employee records with the following fields: emp.-id, name, designation, address, salary and display it. 12

**PART-B**

- Q.5
- a) Explain the process of declaring and initializing pointers with an example. 6
  - b) Explain how to access the value of a variable using pointer. 4
  - c) Explain '&' and '\*' operators with the help of a program. 10
- Q.6
- a) Explain the parameter passing in functions with the help of programs. 12
  - b) Write a program to find factorial of a number using recursion. 8
- Q.7
- a) Explain different modes of opening files with syntax. 10
  - b) Write a C program to copy the contents of one file to another. 10

**End Semester Examination, May 2017**  
**B. Tech.–FirstSemester**  
**INTRODUCTION TO OPEN SOURCE SOFTWARE AND OPEN**  
**STANDARDS(CS-104)**

Time: 3 hrs

Max Marks:100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) What are the types of standard?
  - b) Describe Bluetooth special interest group.
  - c) How early adopters influence the development of a standard?
  - d) What is forking?
  - e) Explain copyleftvs copyright.
  - f) Define 'standards'. Why are industries adopting standard?
  - g) Explain the various categories of degree of adoption.
  - h) What are adoption barriers in open standard?
  - i) What is GCOSTA?
  - j) What are the three main activities of ITU?
- 2x10

**PART-A**

- Q.2
- a) What are open and closed standards? Explain in detail giving suitable examples. 10
  - b) How are the standards beneficial to organizations? 10
- Q.3
- a) Describe various barriers associated with the adoption of standards. 10
  - b) What is the role of IEC? Explain SMB. 10
- Q.4
- a) What is the importance of open standards? Explain. 10
  - b) Write note on De-Jure standard sellers. 10

**PART-B**

- Q.5
- a) Describe various challenges associated with open source projects. 15
  - b) Differentiate between 'copyleft' and 'copyright'. 5
- Q.6
- a) Explain license review process. 10
  - b) What are different roles in open source community? Explain. 10
- Q.7 Write short notes on following:
- a) ASF
  - b) OS 1
  - c) Vendor lock-in
  - d) Unit
- 5x4

**End Semester Examination, May 2017**  
**B. Tech.–Second Semester**  
**ELEMENTS OF DISCRETE STRUCTURES (CS-203)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1 a) Determine the sets A and B given that  
 $A - B = \{1, 3, 7, 11\}$ ,  $B - A = \{2, 6, 8\}$  and  $A \cap B = \{4, 9\}$ .  
 b) State Lagrange's theorem.  
 c) Define 'isomorphic graph'.  
 d) Determine the negation of  $\forall_x \exists_y (P(x, y) \rightarrow Q(x, y))$ .  
 e) How will you differentiate between a general tree and a binary tree?  
 f) Explain semi-group with an example.  
 g) State De Morgan's Law.  
 h) Find the power set of  $\{\{1\}, \emptyset\}$ .  
 i) Define 'complete and connected graph'.  
 j) How many 2-digits even number can be formed by using the digits 1, 3, 4, 6, 8 when repetition of digits is allowed? 2 × 10

**PART-A**

- Q.2 a) Let A, B, C be arbitrary sets; then prove:  
 i)  $(A - B) - C = (A - C) - B$   
 ii)  $(A - B) - C = (A - C) - (B - C)$  5 × 2  
 b) Consider the function  $t, g: R \rightarrow R$  defined by  $f(x) = x^2 + 3x + 1$ ,  $g(x) = 2x - 3$ . Find the composition functions:  
 i)  $fof$  ii)  $fog$  iii)  $gof$  2 × 3  
 c) Let  $s$  be the set of all points in a plane. Let  $R$  be a relation such that for any two points  $a$  and  $b$ ;  $(a, b) \in R$  if  $b$  is within two centimeter from  $a$ . Show that  $R$  is an equivalence relation. 4
- Q.3 a) Show that the propositional formula  $(p \wedge q) \wedge (r \wedge s) \rightarrow p$  for any propositions  $P, q, r, s$  is a tautology. 8  
 b) Prove the following logical equivalence:  
 $(p \rightarrow q) \wedge [\neg q \wedge (r \vee \neg q)] \Leftrightarrow \neg (q \vee p)$  6  
 c) Write the negation of the following assertions and express them in quantifiers form:  
 i) Some students do not live in hostel.  
 ii) Some girls are more intelligent than all boys.  
 iii) The sum of any two odd integers is an even integer. 2 × 3
- Q.4 a) Prove by induction that for  $n \geq 0$  and  $a \neq 1$ ;  
 $1 + a + a^2 + \dots + a^n = \frac{1 - a^{n+1}}{1 - a}$  10  
 b) Show that  ${}^n C_r + {}^n C_{r-1} = {}^{n+1} C_r$ , where  $n \geq r \geq 1$  and  $r$  are natural numbers. 5  
 c) From 10 programmers, in how many ways can 5 be selected when?  
 i) A particular programmer is included every time.  
 ii) A particular programmer is not included at all. 2½ × 2

**PART-B**

- Q.5 a) Solve the recurrence relation  $a_{r+2} - 2a_{r+1} + a_r = r^2 \cdot 2^r$  and find its total solution. 10
- b) Solve the recurrence relation  $a_r - 5a_{r-1} + 6a_{r-2} = 2^r + r$ ;  $r \geq 2$  by the method of generating functions with the initial conditions  $a_0 = 1$  and  $a_1 = 1$ . 10

- Q.6 a) Consider the binary operation  $\times$  and  $Q$ , the set of rational numbers define by  $a \times b = \frac{ab}{2}$ ,  $\forall a, b \in Q$ . Determine whether  $\times$  is:

i) Associative.

ii) Commutative. 2×2

- b) Let  $(I, +)$  be a group, where  $I$  is the set of all integers and  $(+)$  is an addition operation. Determine whether the following subsets of  $G$  are subgroups of  $G$ :

i) The set  $G_1$  of all odd integers.

ii) The set  $G_2$  of all positive integers. 3×2

- c) Describe the following terms:

i) Fields.

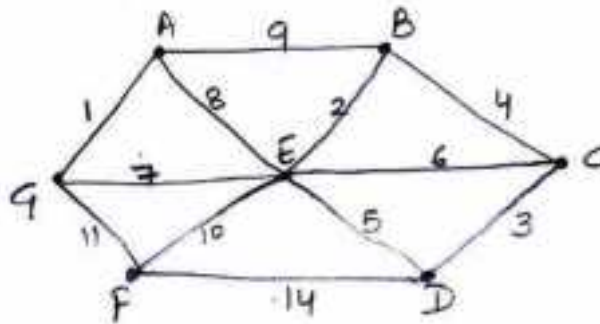
ii) Monoids.

iii) Subgroups.

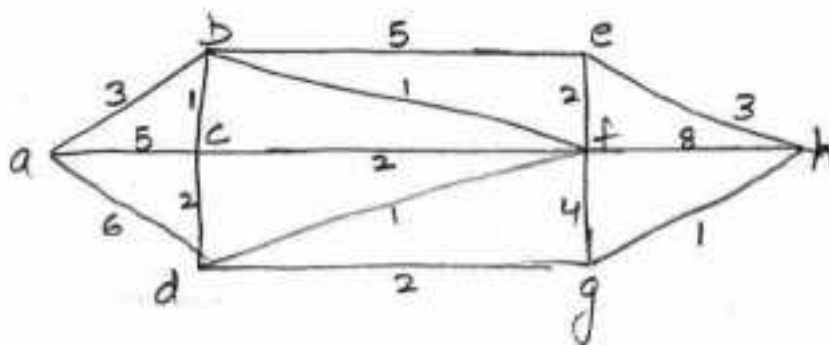
iv) Normal subgroup.

v) Cosets. 2×5

- Q.7 a) Describe Kruskal's algorithm and show, how the Kruskal's algorithm finds a minimum spanning tree of the following graph?



- b) Explain and apply Dijkstra's algorithm to determine a shortest path from vertex 'a' to the vertex 'h' in the following: 10



10

**End Semester Examination, May 2017**  
**B. Tech.– SecondSemester**  
**WEB PROGRAMMING THROUGH PHP AND HTML(CS-205)**

Time: 3 hrs.

Max Marks:100

No. of pages:1

Note: *Attempt FIVE questions in all;Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) How does client and server communicate?
  - b) Discuss the case insensitivity of PHP.
  - c) List any four string manipulation functions.
  - d) What is foreach loop?
  - e) Differentiate between 'implode' and 'explode'.
  - f) Which functions are used to sort an array?
  - g) What is the use of \$this variable?
  - h) Differentiate between GET and POST.
  - i) Briefly discuss the features of XML.
  - j) Show how a session is destroyed in PHP. 2×10

**PART-A**

- Q.2
- a) List various features of PHP. Explain working of PHP. 10
  - b) Calculate simple interest taking two different sets of Principal, Rate and Time in two separate PHP blocks in the same HTML file. 10
- Q.3
- a) Write PHP code for the statement, "pass the marks of 3 subjects as arguments to a function which calculate percentage". Using another function display the grade obtained based on the percentage. 10
  - b) Give classification of operators used in PHP. Show with examples how include and require give different results. 10
- Q.4
- a) Write PHP code creating a multidimensional array and further iterate it using nested foreach loop. 10
  - b) Write PHP code for creating a file of three records and further search one records using pattern matching. 10

**PART-B**

- Q.5
- a) Define 'exception'. Show with an example how an exception is propagated? 10
  - b) Write code for all the dialog boxes in JavaScript. 10
- Q.6
- a) Create a form in HTML. Enter data and send it to the server. How server handles the data? 10
  - b) Write code to start a session, populate data into the session and destroy the session. 10
- Q.7
- a) Create a table using SQL and apply various constraints on it. Also apply aggregate functions on a field of data. 10
  - b) Explain the various features and views of eclipse. 10



**End Semester Examination, May 2017**  
**B. Tech.–Third Semester**  
**WEB PROGRAMMING THROUGH PHP AND HTML (CS-205)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) Differentiate between isset ( ) and inset ( ).
  - b) Give an example of incrementing and decrementing operator.
  - c) What happens if a variable is declared to be static?
  - d) Demonstrate explode ( ) function.
  - e) What is the purpose of "action" attribute in a form?
  - f) Differentiate between count ( ) and filesize ( ) functions.
  - g) List the various dialog boxes in Javascript.
  - h) What is DOM document?
  - i) How a table is deleted in SQL?
  - j) What are hidden fields?

2x10

**PART-A**

- Q.2
- a) What are the features of PHP? Discuss its case insensitivity. Also discuss how and why PHP is embedded in HTML. 10
  - b) Differentiate between variables and constants. Show how they are declared and used in PHP? 10
- Q.3
- a) Declare a string in PHP. Write the syntax and results of any five string manipulation functions. 10
  - b) Write a code for any problem of your choice making use of for-loop, while-loop and do-while loop separately. 10
- Q.4
- a) Create an array. Add five elements to it. Delete the last element, modify first two elements, add three new elements and convert it into string. 10
  - b) Discuss the various modes by which a file can be created. Also explain any four built-in functions used for file handling with examples. 10

**PART-B**

- Q.5
- a) Give definitions for object, class and constructor. Implement parameterized constructor in PHP. 10
  - b) How an exception is different from an error? Give an example showing how custom exceptions are created? 10
- Q.6
- a) Create a form in HTML. Show how the data entered into the form is accessed on server side? 10
  - b) What is a session? How a session is managed? 10
- Q.7
- a) Define 'database'. What role does SQL play? Give examples showing the use of aggregate functions in SQL. 10
  - b) Which syntax rules need to be followed for writing an XML document? Create an XML file and construct a corresponding DOM tree. 10

**End Semester Examination, May 2017**  
**B. Tech.– Third Semester**  
**DISCRETE STRUCTURES(CS-301A)**

Time: 3 hrs.

Max Marks:100

No. of pages:2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Briefly answer:

- a) A bag contains 3 white, 3 black and 2 red balls. One by one, three balls are drawn without replacing them. Find the probability that the third ball is red.
- b) Find the homogenous solution of the difference equation  $a_{r+4} + 2a_{r+3} + 3a_{r+2} + 2a_{r+1} + a_r = 0$ .
- c) Explain Eulerian circuit and Hamiltonian circuit with an example.
- d) Consider an algebraic system  $(A, *)$  where  $A = \{1, 3, 5, 7, \dots\}$  the set of all positive odd integers and  $*$  is a binary operation means multiplication. Determine whether  $(A, *)$  is a semi-group.
- e) Among 100 students, 32 study mathematics, 20 study physics, 45 study biology, 15 study mathematics and biology, 7 study mathematics and physics, 10 study physics and biology and 30 do not study any of three subjects. Find the numbers of students i) studying all three subjects ii) studying exactly one of three subjects.  $4 \times 5$

**PART-A**

Q.2 a) Prove De Morgan's laws.

i)  $(A \cup B)^c = A^c \cap B^c$

ii)  $(A \cap B)^c = A^c \cup B^c$

6

b) Let  $A = \{4, 6, 8, 10\}$  and  $R = \{(4, 4)(4, 10)(6, 6)(6, 8)(8, 10)\}$  is a relation on set A. Determine the transitive closure of R using Warshall's Algorithm. 8

c) Consider  $A = B = C = R$  and Let  $f: A \rightarrow B$  and  $g: B \rightarrow C$  be defined by  $f(x) = x + 9$  and  $g(y) = y^2 + 3$ .

Find the following composition functions:

i)  $f \circ f(a)$  ii)  $g \circ g(a)$  iii)  $f \circ g(b)$  iv)  $g \circ f(b)$  v)  $g \circ f(4)$  vi)  $f \circ g(-4)$  6

Q.3 a) From the following, find out tautology, contingency and contradiction:

i)  $((P \rightarrow Q) \wedge (Q \rightarrow R)) \leftrightarrow (P \leftrightarrow R)$

ii)  $\sim (P \vee (Q \wedge R)) \leftrightarrow ((P \vee Q) \wedge (P \vee R))$

iii)  $[P \wedge (Q \leftrightarrow R)] \vee (R \leftrightarrow P)$

15

b) Define the following with examples:

i) Universal quantifier.

ii) Existential quantifier.

5

Q.4 a) Ram has 5 different 'data structure books', 4 different 'discrete structure books and 5 different 'programming language books'. In how many ways Ram:

i) Can arrange these books on a shelf?

ii) Can these books be arranged on a shelf if all 5 programming language books are on the right?

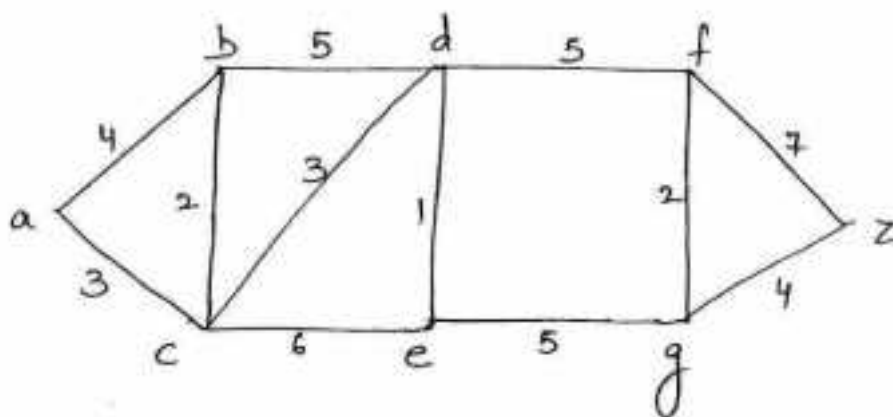
iii) Books can be arranged on a shelf if all 5 data structure books are on the left and all 5 programming language books are on the right. 10

b) Show that  $\frac{1^2}{1 \cdot 3} + \frac{2^2}{3 \cdot 5} + \dots + \frac{n^2}{(2n-1)(2n+1)} = \frac{n(n+1)}{2(2n+1)}$  using mathematical induction. 5

- c) Determine the number of triangles that are formed by selecting points from a set of 15 points out of which 8 are collinear. 5

### PART-B

- Q.5 a) Find the total solution of the Recurrence relation:  
 $a_{r+2} - 2a_{r+1} + a_r = 2^r \cdot 2^r$  10
- b) Solve the recurrence relation  $a_{r+2} - 5a_{r+1} + 6a_r = 2$  by the method of generating functions satisfying the initial conditions  $a_0 = 1$  and  $a_1 = 2$ . 10
- Q.6 a) Let  $(I, +)$  be a group, where I is the set of all integers and '+' is an addition operation. Determine whether the following subsets of G are subgroups of G.
- i) The set  $G_1$  of all odd integers.
- ii) The set  $G_2$  of all positive integers. 12
- b) Write short notes on:
- i) Abelian group.
- ii) Group.
- iii) Rings.
- iv) Field. 8
- Q.7 a) Find the shortest path between  $a$  and  $z$  in the graph shown in figure using Dijkstra's algorithm:



- b) Define the following terms:
- i) Full binary tree.
- ii) Cut-set.
- iii) Bridges.
- iv) Complete binary tree.
- v) Cut-points. 10

**End Semester Examination, May 2017**  
**B. Tech.– ThirdSemester**  
**DATA STRUCTURES AND ALGORITHMS(CS-302)**

Time: 3 hrs

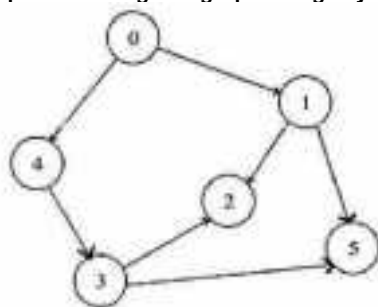
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No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

**Q.1 Answer briefly:**

- a) Differentiate between 'iterative' and 'recursive algorithms'.
- b) Define pointers and write function 'swap' to swap two numbers using pointers.
- c) What is the drawback of linear queue? Which datastructure overcomes it and how?
- d) Define the terms 'complete binary tree' and 'strictly binary tree'.
- e) Write function PUSH to implement stack using array.
- f) What is linear search? Write down its pseudocode.
- g) What is collision? Explain it with the help of an example.
- h) Create BST for the following numbers: 56, 34, 89, 11, 45, 67, 6, 78.
- i) Explain expression trees with an example.
- j) Represent the given graph using adjacency matrix:



2x10

**PART-A**

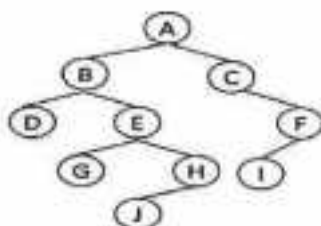
- Q.2**
- a) What is pointer? Mention two advantages of using pointers? Explain pointer declaration and its initialization with the help of an example. 5
  - b) What is pseudocode? Write a pseudocode to find factorial of a number. 5
  - c) Convert the following infix expression into prefix notation. Show all the steps and stack contents:  

$$A - (B + C * (D^A F) - (G / (H + I)) * J$$

10

- Q.3**
- a) What is the difference between circular queue and deque? What are the various types of deques? Write the pseudocode to perform insertion and deletion operation on deques. 10
  - b) Write down the algorithms for the following functions:
    - i) Insertion at the specific position of a circular linked-list.
    - ii) Deletion from the end of a doubly-linear linked-list. 10

- Q.4**
- a) Define traversal of binary tree. Explain three popular methods of binary tree traversals and trace the following tree for all traversals:

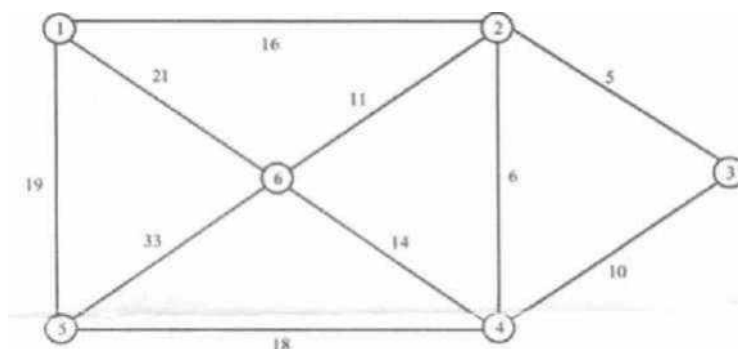


6

- b) What is binary search tree? Explain the operation of searching a value in BST. 4
- c) What is AVL tree? How do you calculate balance factor? Explain in detail with help of suitable examples all types of rotations needed to be done after insertion. 10

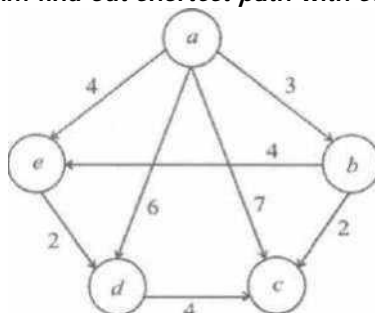
**PART-B**

- Q.5 a) What do you mean by spanning tree of a graph? Find the minimal spanning tree of the following graph using Kruskal's algorithm:



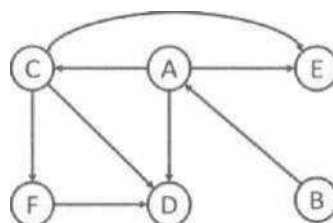
5

- b) Using Dijkstra's algorithm find out shortest path with source node as 'a' for the given graph:



5

- c) What is the difference between BFS and DFS traversal? Write the algorithm and find out both traversals for the following graph:



10

- Q.6 a) Write an algorithm to sort the numbers in a list of integers using merge sort. Discuss the time complexity of merge sort. Also apply the sorting on following elements 12, 25, 10, 11, 5, 6.

10

- b) Write a function in 'C' to sort numbers using insertion sort. Also sort the above given elements using insertion sort and show its complexity using step count method.

10

- Q.7 a) Write both iterative and recursive algorithms for searching an element in a list of integers using binary search. Also state the complexity of binary search.

10

- b) What is hashing? Define hash function and hash table. State and explain various hash functions through suitable examples.

10

**End Semester Examination, May 2017**  
**B. Tech.– Third Semester**  
**COMPUTER ARCHITECTURE AND ORGANIZATION (CS-303A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

- Q.1
- a) Distinguish between architecture and organization.
  - b) Draw the block diagram of multiplexer.
  - c) What is high impedance state in three state buffer?
  - d) Write control word for  $R_1 \leftarrow R_2 + R_3$  for general register CPU organization.
  - e) Give one example of zero address instruction.
  - f) Explain two performance metrics.
  - g) Explain RAM organization with the help of its chip diagram.
  - h) Write RTL for fetch and decode.
  - i) What are the goals of parallelism?
  - j) What is stored program concept? 2 × 10

**PART-A**

- Q.2
- a) What do you mean by micro operations? Explain different types of micro-operations. 10
  - b) Explain multilevel view point of machine. 10
- Q.3
- a) Explain different types of addressing modes. 10
  - b) Differentiate between 'RISC and CISC'. 10
- Q.4
- a) Explain different CPU organizations. 10
  - b) Explain fetch-decode-execute cycle. 10

**PART-B**

- Q.5
- a) Explain different types of control units. 10
  - b) Explain microinstruction sequencing (address sequencer) in detail. 10
- Q.6
- a) What is the need for memory hierarchy? Explain in detail. 10
  - b) Explain different types of cache mapping techniques. 10
- Q.7
- a) Explain pipeline with the help of example. 10
  - b) Explain instruction level parallelism. 10

**End Semester Examination, May 2017**  
**B. Tech.—Third Semester**  
**OBJECT ORIENTED PROGRAMMING SYSTEMS (CS-304A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Briefly Answer:

- a) What are pre-processor directives?
- b) Explain the concept of "this" pointer.
- c) Differentiate between 'composition' and 'inheritance'.
- d) Differentiate between 'read()', 'write()' functions in file with syntax'.
- e) What is runtime polymorphism? Exemplify.
- f) List any two access-specifiers.
- g) Explain dynamic memory allocation of objects.
- h) Explain inline function with an example. Mention its advantages.
- i) Any four I/O manipulators in C++.
- j) Enlist six I/O file opening mode options with explanation

2×10

**PART-A**

Q.2 a) What is encapsulation? Write a program to create a class called "employee2016", which consists name, design, empcode and salary as data member and read(), write() as function members to read and further will print information of first 10 employees. 8

b) Write a program in C++ to check if the given string is a palindrome. 6

c) Demonstrate with a complete C++ program for functions returning objects. 6

Q.3 a) Explain the order of invocation of constructor and destructor with an example. 7

b) Why should the formal arguments of a copy constructor be a reference object? Write the syntax. 6

c) Write a program which uses the concept of dynamic constructor and destructor:

Your output should be  
 Enter First name: Uma  
 Enter Second name: Shankar  
 Enter Last name: Venkatesh  
 The Complete name is: Uma Shankar Venkatesh.

7

Q.4 a) Using method overloading write a program to:

i) overload » operator to enable input through cin.

ii) overload « operator to enable output through cout.

5×2

b) What is function overriding? Give an example.

10

**PART-B**

Q.5 a) Discuss the effect of inheritance on the visibility of members in a  
 -public derivation

-Private derivation

5

b) What is the ambiguity problem in case of multiple inheritances? How it can be removed? Illustrate with an example.

c) Write a program to implement the following relation: Each have their own lists of features along with basic functionality of dialing, receiving a call and messaging. Hide irrelevant details from user by giving your desired attributes.



5

- Q.6 a) List the names of file movement pointers. Explain each of them briefly. 5
- b) Write a function in C++ to print the count of word Thickew theas an independentword in a text file STORY.TXT.

For example, if the content of the file STORY.TXT is:

"There was a monkey in the zoo. The monkey was very naughty".

Output: the = 2

10

- c) When to use Random access file. Write the syntax to open a randomaccess file in read mode. 5

Q.7 Explain the following:

- a) Generic function with anexample.
- b) NEW ANDdelete.
- c) LISTS.
- d) Type Conversion; conversion from one class type to another.

5x4



**End Semester Examination, May 2017**  
**B.Tech-Third / Fourth Semester**  
**DATABASE MANAGEMENT SYSTEMS(CS-305A)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part B. Each question carries equal marks.*

- Q.1 a) Write the roles and responsibilities of DBA.  
 b) Differentiate between 'weak' and 'strong entities'.  
 c) What are integrity constraints?  
 d) Why joins are better than Cartesian product?  
 e) What is log based recovery? 4x5

**PART-A**

- Q.2 a) Explain three level architecture of DBMS. What do you understand by logical and physical data independence. 10  
 b) Write the limitations of using traditional file processing system. 10
- Q.3 a) Explain network, hierarchical and relational model with example. Also, write the advantages of network model over hierarchical model. 10  
 b) Draw an E-R diagram for Bank Management System. Also, convert it in RDBMS. 10
- Q.4 a) What is normalization? Why do we need normalization? Explain with example upto 3 NF. 12  
 b) What do you understand by dependency preservation? Also, give example. 8

**PART-B**

- Q.5 a) What is relational algebra? Explain all the operators used in relational algebra with example. 10  
 b) Write a short note on 'tuple relational calculus'. 5  
 c) Differentiate between 'inner' and 'outer join operation'. 5
- Q.6 a) Define 'hashing'. Explain various collision resolving techniques. 10  
 b) Explain direct, sequential and index sequential file organization techniques. 10
- Q.7 Write short notes on:  
 i) Deadlock prevention.  
 ii) Concurrency control.  
 iii) Recovery.  
 iv) Conflict serializability. 5x4

**End Semester Examination, May 2017**  
**B. Tech.– Third Semester**  
**DATA STRUCTURES USING JAVA(CS-306)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1 a) WHAT IS ABSTRACTION?  
 B) DESCRIBE SPACE COMPLEXITY OF AN ALGORITHM.  
 C) WHAT DO YOU UNDERSTAND BY MIN HEAP?  
 D) EXPLAIN THE CONCEPT OF A QUEUE.  
 E) GIVE AN EXAMPLE OF TAIL RECURSION.  
 F) DESCRIBE THE PROBLEM OF SORTING.  
 G) DEFINE A CLASS.  
 H) WHAT IS THE USE OF 'SUPER' KEYWORD?  
 I) WHAT DO YOU UNDERSTAND BY ABSTRACT DATA TYPES?  
 J) STATE TWO PROPERTIES OF A BINARY TREE.

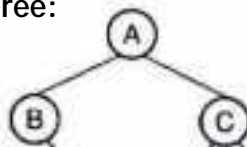
**2x10**

**PART-A**

- Q.2 a) WHAT DO YOU UNDERSTAND BY STRINGS? EXPLAIN ANY FIVE BUILT-IN STRING FUNCTIONS WITH EXAMPLES.  
**10**  
 b) EXPLAIN THE DECLARATION AND INITIALIZATION OF A 2D ARRAY. WRITE A PROGRAM IN JAVA FOR CLONING A 2D ARRAY.  
**10**
- Q.3 a) DEFINE 'CONSTRUCTORS'. EXPLAIN THE CONCEPT OF DEFAULT AND PARAMETERIZED CONSTRUCTORS WITH THE HELP OF AN EXAMPLE.  
**10**  
 b) WRITE A PROGRAM IN JAVA FOR APPENDING TWO FILES. **10**
- Q.4 a) DESCRIBE THE LINKED LIST DATA STRUCTURE. WRITE AN ALGORITHM TO INSERT AND DELETE AN ELEMENT AT THE FIRST POSITION (HEAD) IN A LINKED LIST.  
**10**  
 b) WRITE A PROGRAM TO IMPLEMENT A QUEUE USING ARRAYS. **10**

**PART-B**

- Q.5 a) WHAT IS HASHING? WHEN DOES A COLLISION OCCUR? EXPLAIN THE TECHNIQUES TO RESOLVE A COLLISION.  
**10**  
 b) WHAT ARE ASYMPTOTIC NOTATIONS? DESCRIBE THE BIG OH, SMALL OH, BIG OMEGA AND BIG THETA NOTATIONS.  
**10**
- Q.6 a) Define 'recursion'. Write an algorithm to find factorial of a number using recursion. **10**  
 b) What do you understand by searching? Write an algorithm for binary search. **10**
- Q.7 a) Explain tree traversals. Give the pre-order, post-order, in-order, level-order traversals for the following tree:



10

- b) Explain the concept of binary search trees. Write an algorithm to insert and delete an element in a binary search tree. 10

**End Semester Examination, May 2017**  
**B. Tech.—Third Semester**  
**APPLIED STATISTICAL ANALYSIS (CS-307)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt Any TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) What is the difference between census and sampling?
  - b) How quantitative data can be summarized?
  - c) Why Z score is needed in normal distribution?
  - d) What do you mean by data transformation?
  - e) What is 68-95-99.7 rule?
  - f) What is linear regression? Explain with a graph.
  - g) Which sample statistic is used in ANOVA? Give its formula?
  - h) What is a neuron?
  - i) Calculate the mean and median of the following data:  
66 24 89 55 22 70 2
  - j) How do you identify type-II errors? 2 × 10

**PART-A**

- Q.2
- a) Write a note on 'SPSS'. 8
  - b) Explain the difference between dependent and independent variables with the help of examples. 6
  - c) What are the basic steps of research methodology? 6
- Q.3
- a) What are the levels of measurement? Explain with an example. 10
  - b) Calculate the measure of dispersion of the following set of data using all the methods. Also explain each one of them.  
Student's marks: 65, 80, 90, 5, 10, 15, 40. 10
- Q.4
- a) Define the following with an example:
    - i) Hypothesis.
    - ii) Null hypothesis.
    - iii) Alternate hypothesis. 6
  - b) Which test is carried out in hypothesis testing for small sample of population? Explain its procedure in brief. 12
  - c) What are sampling errors? 2

**PART-B**

- Q.5
- a) When does ANOVA is used for hypothesis testing? Explain the procedure for carrying out ANOVA test. 10
  - b) From an observation, Honda claims that out of 25 users atleast 80% of its customers are satisfied. Given the following set of data, prove whether the hypothesis given by Honda is accepted or rejected?  
 Sample mean,  $(\bar{x}) = 0.769$   
 Population mean  $(\mu) = 0.80$   
 Variance  $(\sigma) = 0.079$  10
- Q.6
- a) What is correlation? Explain different types of correlation. How do you find the relationship between two variables using Pearson coefficient. 10
  - b) Compute the correlation between number of cigarettes and capacity of lungs from the following data:

Cigarettes (x)	Lung capacity (y)
0	45
5	42
10	33
15	31
20	29

10

- Q.7 Write short notes on:
- a) Decision trees.
  - b) Cluster analysis.

10×2

**End Semester Examination, May 2017**  
**B. Tech.—Third Semester**  
**INTRODUCTION TO IT INFRASTRUCTURE LANDSCAPE (CS-308)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt Any TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) What do you understand by operating system?
  - b) Give SQL overview.
  - c) Explain 'zoning'.
  - d) Give an overview of LDAP.
  - e) Explain switching.
  - f) Explain routing.
  - g) Explain loss of privacy.
  - h) List OLAP operations with an example.
  - i) Explain common network topologies.
  - j) Differentiate between virus, worm and trojan horse.
- 2 × 10

**PART-A**

- Q.2
- a) Explain the different structure types of database management systems. 5
  - b) Explain the different data security concepts which are used in DBMS. 5
  - c) Explain RDBMS. Explain in detail different SQL categories based on functionality involved. 5
  - d) Differentiate the terms: database house, data marts and data mining. 5
- Q.3
- a) Explain storage networking technology in detail. 5
  - b) What do you mean by RAID technology? Explain RAID function and different RAID technologies. 5
  - c) What are the different types of virtualization in storage system? Explain in detail. 5
  - d) Define fire channel and fabric in storage. Explain storage area network. 5
- Q.4
- a) What is server technology? Give different types of servers. 5
  - b) What is operating system? Give different features of operating system. 5
  - c) What are hypervisors? Explain features of hypervisors along with its types. 5
  - d) What are virtual machines? Why do we need virtual machines and how are they different from partitioning? 5

**PART-B**

- Q.5
- a) Explain LDAP protocol for directory services along with different LDAP models in detail. 8
  - b) Explain security model used in LDAP. Give different LDAP replication topologies. 6
  - c) What are different directory server concepts? Explain LDAP data interchange format (LDIF) in detail. 6
- Q.6
- a) What are the different physical and logical topologies that are followed in computer networks? 5
  - b) What do you mean by IP routing? What are the functions that are performed by router? Explain types of routing. 5
  - c) What is LAN? How can one create virtual LAN in computer network? What are different types and benefits of VLAN? 5

d) What is network security? What are different categories of security technology? 5

- Q.7
- a) What are applications and middle ware? Explain common messaging system in brief. 5
  - b) Explain multi-tier architecture of web-tier deployment along with its advantages. 5
  - c) What is data-warehousing? Explain warehouse modeling approaches in detail. 5
  - d) What do you mean by dimensional modeling in data warehouse? Explain different concepts associated with dimensional modeling in brief. 5

**End Semester Examination, May 2017**  
**B. Tech.—Fifth Semester**  
**OBJECT ORIENTED PROGRAMMING USING JAVA (CS-321)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt Any TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

**Q.1 Answer the following:**

- a) What do you understand by data hiding and data abstraction?
- b) What is a package in Java?
- c) Why multiple inheritance is not allowed in Java?
- d) List a few areas of application of object-oriented programming paradigm.
- e) What is an applet?
- f) What are class/static variables? Give an example.
- g) Explain the use of 'throw' keyword.
- h) Explain any two features of Java.
- i) What is a file? Why do we require files to store data?
- j) What is the use of final keyword? Give an example.

2 × 10

**PART-A**

- Q.2 a) Describe how object-oriented paradigm is different from procedure-oriented. 10
- b) Explain the concept of classes and objects. How are data and methods organized in an object-oriented paradigm? 10
- Q.3 a) Discuss all the control statements used in Java. 12
- b) What is an array? Explain the declaration, creation and initialization of 1D and 2D array. 8
- Q.4 a) Define 'constructors'. Explain the concept of default and parameterized constructors with the help of an example. 10
- b) What are nested classes? Write a program in Java to implement an inner class. 10

**PART-B**

- Q.5 a) Discuss the different levels of access protection (access modifiers) available in Java. 12
- b) What is an interface? How do we tell java that the class we are creating, implements a particular interface? Differentiate between a 'class' and an 'interface'. 8
- Q.6 a) What are input and output streams? Explain with illustrations. Describe the major tasks of input and output stream classes. 10
- b) What are exceptions? Explain the syntax of exception handling code. Write a program to implement try and catch blocks. 10
- Q.7 a) Explain the steps in creation and execution of an applet with an example. How do applets differ from application programs? 10
- b) Write short notes on:
  - i) Event handling.
  - ii) Graphics programming.

5 × 2



**End Semester Examination, May 2017**  
**B. Tech.–Third Semester**  
**INFORMATION SECURITY FUNDAMENTALS (CS-322)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

**Q.1** Briefly answer:

- a) Define 'intrusion detection system'.
- b) Write down the difference between 'auditing' and 'authentication'.
- c) Write down the difference between 'data in motion' and 'data at rest'.
- d) What do you mean by substitution ciphers?
- e) Define 'network operating system'.
- f) What is cryptography?
- g) Define 'data reduction'.
- h) What is eavesdropping?
- i) Define 'log management'.
- j) What is IP spoofing attacks?

2 × 10

**PART-A**

- Q.2** a) Explain the role of operation security in our personal lives. 10  
 b) Define 'information security'. Explain various elements of information security. 10
- Q.3** a) Discuss protecting network traffic. 10  
 b) Define 'physical security'. Explain the physical security controls in detail. 10
- Q.4** a) Explain updating operating system hardening. 10  
 b) What is application security and what are the various tools available for application security? 10

**PART-B**

- Q.5** Explain the security auditing standards in detail. 20
- Q.6** a) Differentiate between management and governance. 10  
 b) Write the short notes on:  
     i) What are the various benefits of physical security?  
     ii) Write down the scope of network security. 5 × 2
- Q.7** a) Explain the Sarbanes-Oxley. 10  
 b) How to handle notification and reporting of the network. Explain in brief. 10

**End Semester Examination, May 2017**  
**B. Tech.–Fourth/ Seventh / Eighth Semester**  
**COMPUTER NETWORKS(CS-401A)**

Time: 3 hrs

Max Marks:100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

- Q.1    a) What is the difference between port address, logical address and physical address?  
       b) Differentiate between 'flow control' and 'congestion control'.  
       c) What is the need of ARP?  
       d) What do you mean by 'framing'?  
       e) List two main limitations of bridges. 4x5

**PART-A**

- Q.2    a) Explain how to build network with OSI reference model. 10  
       b) Compare and contrast different type of switching methodologies. 10
- Q.3    a) Describe the CSMA/CD protocol and comment on its performance for medium access. 10  
       b) What are the common fast ethernet implementations? Explain in detail. 10
- Q.4    a) How is an ATM virtual connection identified? 6  
       b) Discuss frame relay physical layer. 8  
       c) Why is SONET called a synchronous network? 6

**PART-B**

- Q.5    a) Compare TCP and UDP header. List the fields in the TCP header that are missing from UDP header. 10  
       b) List RIP shortcoming and their corresponding fixes. 10
- Q.6    a) What is the difference between primary and secondary server? 5  
       b) Write short notes on:  
           i) WWW  
           ii) HTTP  
           iii) FTP 5x3
- Q.7    a) What is Firewall? Explain its different types. 10  
       b) What are the various data encryption techniques? Explain. 10

**End Semester Examination, May 2017**  
**B. Tech.–Fourth Semester**  
**ANALYSIS AND DESIGN OF ALGORITHMS (CS-402)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1
- Define and explain the term: 'time complexity'.
  - How is dynamic programming different from backtracking?
  - What are greedy methods?
  - Write recurrence relation for All Pair Source Problem (APSP).
  - What do you understand by spanning tree?
  - What is prefix function? Explain with an example.
  - Analyze the efficiency of heap sort.
  - Differentiate between iterative and recursive algorithms.
  - What are NP complete problems?
  - What is optimal binary search?

2x10

**PART-A**

- Q.2 a) Write conditions of Master Theorem and solve the following using Master Theorem:  $T(n) = 3T\left(\frac{n}{4}\right) + n \lg n \quad \forall n \geq 4; T(1) = 1$

8

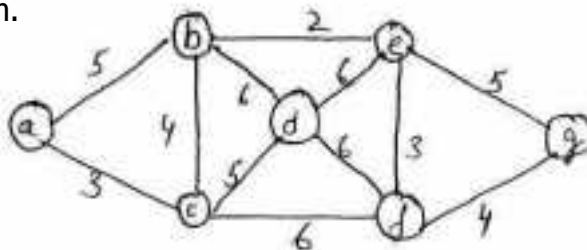
- b) What is an asymptotic notation? Write and explain different types asymptotic notations with graphs. 12

- Q.3 a) Write and explain Knuth–Morris–String matching algorithm. 10
- b) What is Rabin Karp string matching? For working modulo  $q = 11$ , how many superiors hit does Rabin Karp matcher encounter in the text  $T = 3141592653589793$  when looping for pattern  $P = 26$ ? 10

- Q.4 a) Write the pseudocode for quick sort algorithm. Analyze its efficiency. Also sort the followings list of numbers using quick sort 6, 2, 7, 4, 1, 3, 9. 12
- b) Write and explain Strassen's Matrix Multiplication Algorithm. 8

**PART-B**

- Q.5 a) Write greedy algorithm to solve the job sequencing problem with deadlines. 8
- b) Write Prim's algorithm for minimum spanning tree and solve the following using Prim's algorithm.



12

- Q.6 a) Construct a longest common subsequence (LCS) from:  $X = \{A, B, C, B, D, A, B\}$  and  $Y = \{B, D, C, A, B, A\}$  using dynamic programming.

10

- b) Write and explain Dynamic approach to find matrix chain multiplication. 10

- Q.7**    a) Explain the solution of sum of subset problem using backtracking. **10**  
      b) What is 4 queen problem? Explain the solution of this problem using backtracking. **10**

**End Semester Examination, May 2017**  
**B. Tech.–Third / Fourth Semester**  
**PRINCIPLES OF OPERATING SYSTEMS(CS-403A)**

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1 a) Define the following terms:  
 i) Multiprogramming ii) Multitasking iii) Multiuser iv) Multiprocessing  
 b) What is PCB?  
 c) What are CPU scheduling criteria?  
 d) What is wait for graph?  
 e) How we can recover from deadlock?  
 f) What is paging with segmentation?  
 g) Differentiate between internal and external fragmentation.  
 h) What is distributed file system?  
 i) Explain I/O Hardware.  
 j) What are semaphores?

2x10

**PART-A**

- Q.2 a) What is an operating system? Explain its functions and also explain the various operating system services. 12  
 b) What is a system call? Explain various system calls. Why do we need system programs? 8

- Q.3 a) What is a process? Explain different steps of a process using diagram. 5  
 b) What is multi-threading? What are the benefits of Multi – threading? 5  
 c) Consider the following set of processes with arrival time and CPU burst time in milliseconds:

Process	Arrival Time	Burst – Time
P <sub>1</sub>	0	4
P <sub>2</sub>	1	2
P <sub>3</sub>	2	5
P <sub>4</sub>	3	4

Find the average waiting time and average turn-around time using GANTT chart for FCFS and SJF (Preemptive and non-preemptive). 10

- Q.4 a) Explain Banker's algorithm for deadlock avoidance in detail. 12  
 b) What is race condition? Explain various algorithms for critical section problems. 8

**PART-B**

- Q.5 a) Explain in detail paging technique for Memory Management. Draw page table and explain how logical address is converted to physical address in paging. 10  
 b) What is virtual memory? Why do we need page-replacement? Explain different algorithms for page replacement with their advantages and disadvantages. 10
- Q.6 a) What is a file? What operations can be performed on a file? 4

- b) What are various file access methods? Explain each with advantages and disadvantages. 6
  - c) Explain various directory structures. 4
  - d) What is disk scheduling? Which algorithms are used for disk scheduling? 6
- Q.7
- a) How process management and scheduling is implemented in LINUX? 10
  - b) What are system components of windows XP? How file system is handled in windows XP? 10

**End Semester Examination, May 2017**  
**B. Tech.–Fourth Semester**  
**THEORY OF AUTOMATA AND COMPUTATION (CS-404A)**

Time: 3 hrs

Max Marks: 100

No. of pages: 2

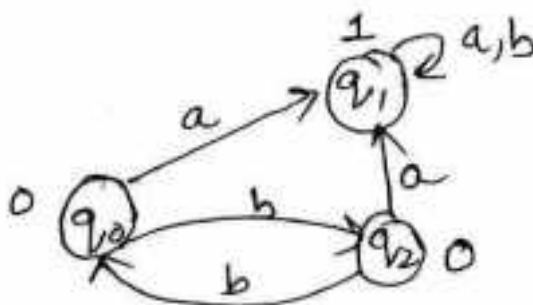
Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1
- Draw the automata that accepts a string which starts 'a' and end with 'b'.
  - Give the regular language over the alphabet  $\Sigma = \{a, b\}$  for the string that end in b and have an even number of b's in total.
  - Define 'push down automata'.
  - Differentiate between NFA and DFA.
  - Find a language generated by grammar G where G is  $(\{s\}, \{a\}, \{s \rightarrow ss\}, s)$ .

4x5

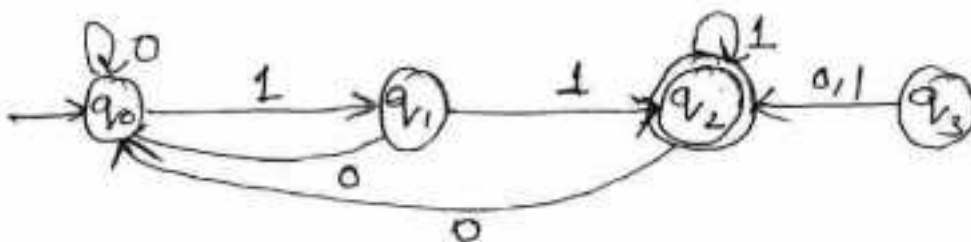
**PART-A**

- Q.2 a) Convert the given Moore machine into Melay machine for the given figure:



10

- b) Construct a minimum state automata equivalent to the given transition diagram:



10

- Q.3
- Construct a grammar G, generating the language  $L = \{a^n b^n c^n \mid n \geq 1\}$  5
  - What is type 0, type 1, type 2, and type 3 grammar? Distinguish between them by giving an example. 10
  - Find the language generated by the grammar: 5

$$G: \quad S \rightarrow 0S1 \mid 0A1, \quad A \rightarrow 1A \mid 1$$

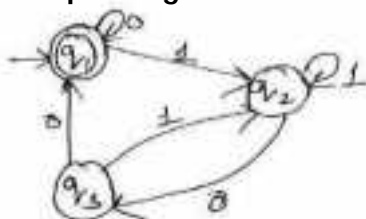
- Q.4 a) Prove the identity using Arden's theorem:

$$(a^*ab + ba)^*a^* = (a + ab + ba)^*$$

6

- b) Construct a Transition System corresponding to the R.E  $(ab + c^*)^*b$  7

- c) Construct a R.E. corresponding to the state diagram given in figure.



7

255/4

**PART-B**

- Q.5**
- Convert the grammar into CNF:  
 $S \rightarrow ABa, A \rightarrow aab, B \rightarrow AC.$  5
  - If CFG is  $S \rightarrow SbS \mid a$  show that G is ambiguous. 5
  - Find a reduced grammar equivalent to grammar:  
 $S \rightarrow aAa, A \rightarrow bBB, B \rightarrow ab, C \rightarrow ab$  10
- Q.6**
- Convert a PDA accepting the language:  
 $L(G) = 0^m 1^m 2^n \mid m, n \geq 1$  7
  - Construct the equivalent PDA for the given CFG.  
 $S \rightarrow Saa \mid aSa \mid aaS$  5
  - Construct a CFG which accepts null store N (A) where:  
 $A = (\{q_0, q_1\}, \{a, b\}, \{z_0, z\}, \delta, q_0, z_0, \phi)$   
 Where  $\delta$  is given by:  
 $S(q_0, bz_0) = \{(q_0, zz_0)\} \quad \delta(q_0, \Lambda, z_0) = \{(q_0, \Lambda)\}$  8
- Q.7**
- What is halting problem of a Turing machine? 5
  - Prove that union of two recursive enumerable language is a recursive enumerable. 7
  - Construct a Turing machine for the language:  
 $0^n 1^n \mid n \geq 1$  8



## End Semester Examination, May 2017

### B. Tech.– Fourth/Fifth Semester CYBER SECURITY (CS-405)

Time: 2 hrs.

Max Marks:50

No. of pages:1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

- Q.1    a) What is uniform resource locator?  
        b) What is denial of service attack?  
        c) What are various topologies in network?  
        d) Explain cross site scripting.  
        e) List general guidelines of forensics. 2 × 5

#### **PART-A**

- Q.2    a) What are various types of network (LAN, WAN and MAN)? Explain in detail. 6  
        b) Convert the following IP Address in binary form and also write its class 4  
              130.68-216.3
- Q.3    a) Explain the terms in context of computer security-malware, web attacks and session hijacking. 6  
        b) Explain the following terms:  
              i) Sneakers.  
              ii) Script kidding. 2x2
- Q.4    a) Explain the various types of attacks in cyber security in reference to investment offers and auction frauds. 6  
        b) Write short notes on:  
              i) Cyber stalking.  
              ii) Identify theft. 2x2

#### **PART-B**

- Q.5    Explain the following terms in detail:  
        a) Active scanning techniques. 6  
        b) Passive scanning techniques. 4
- Q.6    Explain the following:  
        a) Secure the evidence. 3  
        b) Document trail. 3  
        c) Finding evidence in the system logs. 4
- Q.7    a) What is the need of protection from cyber laws? 5  
        b) Write scope and coverage of cyber laws. Explain in detail. 5

**End Semester Examination, May 2017**  
**B. Tech.–FourthSemester**  
**DATA MINING AND PREDICTIVE MODELING (CS-406)**

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- What is data mining? What is the need for data mining?
  - Explain the methods for sampling the data.
  - What is missing value? What are the methods to ignore missing values?
  - Explain COX Regression.
  - What are the components in which data set is splitted?
  - What is the need for data preprocessing?
  - What are the common data mining tasks? Explain briefly.
  - What is the difference between classification tree and regression tree? Explain with an example.
  - What is confusion matrix? Why it is used?
  - What are the challenges for mining the data?

2x10

**PART-A**

- Q.2
- What is KDD Process model? Explain all the steps involved in it. 10
  - Explain the techniques used in data mining. 5
  - What are the areas where data mining techniques can be applied? Explain briefly. 5
- Q.3
- What are the sources for reading the data? Explain with an example. 5
  - What is outlier in a data set? Explain the methods for detecting outliers? Is it necessary to ignore outlier in the data set everytime? What is the application where outlier detection plays an important role? 10
  - Explain the need for cleaning the data. 5
- Q.4
- What is the data transformation? Explain methods for transforming the data in detail. 7
  - What is coding? Explain the coding system for different kinds of data with an example. 7
  - What is binning? Explain binning methods for data smoothing. 6

**PART-B**

- Q.5
- How to partition the data set? Explain the components of the partitioned data set. 7
  - What is classification? Explain the decision tree classification method. Draw the decision tree for the following data set and follow the steps given:
    - Train the data set.
    - Draw out rules for classification.
    - Test the model for new data.

RID	age	income	student	class : buys-computer
1	youth	high	no	no
2	youth	medium	yes	yes
3	middle-age	high	no	yes

4	senior	medium	no	yes
5	senior	low	yes	yes
6	senior	high	yes	yes
7	middle-age	low	no	no
8	youth	low	yes	yes
9	youth	high	yes	yes
10	senior	medium	yes	yes
11	middle-age	medium	yes	no
12	middle-age	high	yes	no

Through the tree drawn predict the answer for the following data:

middle-age, medium, no, buys-computer = \_\_\_\_\_?

13

- Q.6 a) What are association rules? Explain market basket analysis. What are the measures powers of association? 8
- b) What is regression technique? Explain in detail linear regression and logistic regression in detail. 6
- c) Explain Apriori algorithm with an example. 6
- Q.7 a) What is model evaluation? Why it is used? Explain the following evaluations charts with diagram for evaluating model:  
 i) Lift and Gain Charts.  
 ii) ROC Chart.  
 iii) Area Under Curve (AUC). 12
- b) Explain bootstrap and cross validation method for estimating prediction error. 8

## End Semester Examination, May 2017

B. Tech.–FourthSemester

### DATA WAREHOUSING AND MULTI DIMENSIONAL MODELING (CS-407)

Time: 3 hrs

Max Marks:100

*No. of pages: 1*

**Note:** *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

- |     |  |   |
|-----|--|---|
| Q.1 | a) Explain any two approaches for data warehousing modeling.   | 4 |
|     | b) What is data staging and ETL in data warehousing?   | 4 |
|     | c) Explain the design terminology of an R-OLAP system.   | 4 |
|     | d) Case study: The implementation of data warehousing project for a chain of home entertainment rental stores. | 8 |

#### **PART-A**

- |     |   |    |
|-----|---|----|
| Q.2 | a) What is the concept of data warehousing? Mention the different measures for designing an efficient data warehouse. | 15 |
|     | b) Explain the different data replication techniques.   | 5  |
| Q.3 | a) Explain any two approaches to implement the architecture of data warehousing.                                      | 12 |
|     | b) How can we use slice and dice techniques in OLAP operators?  | 8  |
| Q.4 | a) Describe the multi-dimensional model structure.  | 10 |
|     | b) Differentiate between 'warehousing' and 'OLTP model'.  | 10 |

#### **PART-B**

- |     |  |    |
|-----|--|----|
| Q.5 | a) Briefly describe the validation techniques and detailed dimensions.             | 10 |
|     | b) What are the different challenges while designing ROLAP?                        | 10 |
| Q.6 | a) What are the advantages of MOLAP system?  | 8  |
|     | b) What are the usages of MOLAP, ROLAP system?                                     | 12 |
| Q.7 | Give a brief detail on fact-oriented design technique with the help of an example. | 20 |

**End Semester Examination, May 2017**  
**B. Tech.–FourthSemester**  
**IT-INFRASTRUCTURE LIBRARY(CS-408)**

Time: 3 hrs

Max Marks:100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

- Q.1    a) Explain the impact of IT on education.  
        b) What are the five major aspects of service design?  
        c) What are the objectives of service transition?  
        d) Draw and explain the cycle of service operation processes.  
        e) Explain the continual service improvement model. 4x5
- PART-A**
- Q.2    a) Explain the different phases of service lifecycle model. 10  
        b) What are the different activities of service strategy? Explain. 10
- Q.3    a) Explain the underlying processes of service design. 10  
        b) What is supplier management cycle? Explain. 10
- Q.4    a) What is service transition process? Explain the different processes involved in it. 10  
        b) Explain the 7 R's of change management. 10
- PART-B**
- Q.5    a) What are the different activities in event management? 10  
        b) What is problem management? Explain its different activities with example. 10
- Q.6    a) What is continual service improvement in ITIL? 8  
        b) What are the seven steps in improvement activities? Explain. 12
- Q.7    a) What are the benefits of ITIL? Give real life examples. 10  
        b) Give overview of ISO-20000:2011 standard. Why is it important? 10

**End Semester Examination, May 2017**  
**B. Tech. (CSF)–Fourth Semester**  
**IT SERVICE MANAGEMENT (CS-409)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) What do you mean by change management?
  - b) What is the utility of business service catalogue?
  - c) What is the significance of change evaluation?
  - d) What is access management?
  - e) Quote the various activities of service desk.
  - f) Define 'release management'.
  - g) What are the components configuration management?
  - h) Differentiate the various types of changes.
  - i) What is the difference between an event and a problem?
  - j) What is the function of availability management?
- 2x10

**PART-A**

- Q.2
- a) Define 'IT service management'. What does it deal with? State its importance in the current industrial scenario in detail. 10
  - b) State and explain the various objectives to be met after implementation of IT service management. 10
- Q.3
- a) What is aim of demand management? Explain the various key activities involved in it. 10
  - b) Discuss the classification of capacity management and explain its relationship with other processes. 10
- Q.4
- a) Explain the scope of IT service continuity management. List and explain the main activities involved in it. 10
  - b) How do we classify information security management services? Can we rely on any one single approach? Explain why? 10

**PART-B**

- Q.5
- a) How do we ensure to create an ideal service catalogue? What are the various categories to be viewed? 10
  - b) Explain the various heads to be managed for financial management. 10
- Q.6
- a) Why do we need change management? Explain the step-wise procedure used to execute change management. 10
  - b) How do we classify service testing? Explain the various activities involved in it. 10
- Q.7
- a) Define 'an event'. How do we perform event management? 10
  - b) How do we differentiate between an event and a problem? Explain the various activities covered under problem management. 10

**End Semester Examination, May 2017**  
**B. Tech.— Fourth Semester**  
**INTRODUCTION TO VIRTUALIZATION AND CLOUD COMPUTING**  
**(CS-421)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) What do you mean by virtualization? Why do you need it?
  - b) Explain few short comings of physical infrastructure.
  - c) What is a virtual machine?
  - d) Differentiate between 'emulation' and 'simulation'.
  - e) Explain how virtualization is an enabler for cloud.
  - f) What is a private cloud? Give an example.
  - g) Define the term 'Cloud Bursting' w.r.t. cloud.
  - h) What are the benefits of cloud?
  - i) What is a hypervisor? Explain its types.
  - j) What are the protocols used in establishing a virtual private network? 2 × 10

**PART-A**

- Q.2
- a) Explain classification of virtualization based on the extent of hardware emulation. 10
  - b) What are the benefits of virtualization? Explain these benefits along with its impact. 10
- Q.3
- a) What is desktop virtualization? Discuss the various constraints in it. 10
  - b) Discuss storage virtualization and its types. 10
- Q.4
- a) What is VPN? How does it work? Discuss its benefits. 10
  - b) Explain application virtualization, its infrastructure along with the benefits. 10

**PART-B**

- Q.5
- a) Explain eight major components of cloud composition. 10
  - b) What are the various cloud computing solution components? Explain in brief. 10
- Q.6
- a) What are the various cloud deployment decision factor? Explain. 8
  - b) Define public, private and hybrid cloud. What are the pros and cons of each model? Discuss in which situations an organization would move its infrastructure to hybrid cloud. 12
- Q.7
- a) Explain the key points that act as a trigger for virtualization. 10
  - b) Define cloud workload and discuss its various types. 10

**End Semester Examination, May 2017**  
**B. Tech.–FourthSemester**  
**IT DATA SECURITY(CS-423)**

Time: 3 hrs

Max Marks:100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q. 1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

Q.1 Describe in brief the following:

- a) Define data security with its importance.
- b) Differentiate between 'companion virus' and 'phage virus'.
- c) What is identity theft?
- d) How is spear phishing different from clone phishing?
- e) What is application level sniffing?
- f) Differentiate between 'bluejacking' and 'bluesnarfing'.
- g) What is UPIC with respect to banking fraud countermeasure?
- h) Define data masking process and why it is done?
- i) Differentiate between 'software' and 'hardware firewall'.
- j) What is assess and hardening in IBM Infosphere Guardium?

2x10

**PART-A**

Q.2 a) Explain how data security is beneficial for maintaining privacy of data. What are the elements to consider for a better security mechanism? 10

b) What is banking fraud? Explain banking fraud threats in detail. 10

Q.3 a) Explain in detail the threat techniques of malwares. 10

b) What is sniffing? Explain different types of sniffing in detail. 10

Q.4 a) What is dumpster diving? How it can be prevented? 5

b) Explain the following:

- i) Baiting.
- ii) Pre-texting.
- iii) Tailgating.
- iv) Phishing.
- v) Phone-phishing.

3x5

**PART-B**

Q.5 a) Explain data encryption process in detail with its benefits. 5

b) Describe in detail the following:

- i) Honeypots.
- ii) IPS.
- iii) DMZ.

5x3

Q.6 a) State some methods for performing data backup in detail. 10

b) State the countermeasures for cross-site scripting forgery. 10

Q.7 What is database activity monitoring? Explain in detail the different phases and functions offered by IBM InfosphereGuardium. 20



**End Semester Examination, May 2017**  
**B. Tech.–Fifth Semester**  
**INFORMATION STORAGE AND MANAGEMENT (CS-501)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

Q.1 Describe in brief the following:

- a) Define 'data proliferation'.
- b) What do you mean by data center?
- c) What is a fibre channel?
- d) Define 'LUN masking'.
- e) What do you mean by HBA?
- f) What is SCSI?
- g) Define 'CAS'.
- h) What do you mean by virtualization?
- i) Define 'threat'.
- j) Define 'RAID 6-level'.

2 × 10

**PART-A**

Q.2 a) What are the key requirements of data centre elements? 10

- b) i) Define 'Data'.
- ii) Define 'information'.
- iii) Differentiate between 'data' and 'information'.

2 × 3

c) Discuss in brief about evolution of storage technology and architecture. 4

Q.3 a) What do you mean by a host? Discuss in brief the logical components of a host. 7

b) Discuss the physical components of connectivity. 5

c) List and discuss various disk drive components. 8

Q.4 a) What do you mean by storage area network? List its components and benefits. 10

b) What do you mean by inter switch link? Explain all the port types in an FC network with suitable diagram. 10

**PART-B**

Q.5 a) Define local replication. Discuss the possible uses of local replica. 7

b) Explain Host based local replication technique. 5

c) Define disaster recovery. Explain various techniques used for disaster recovery. 8

Q.6 a) Explain the managing storage infrastructure activities in detail. 10

b) Write short notes on:

- i) Alerting of events.
- ii) SMI.

5 × 2

Q.7 a) Explain the key elements of risk triad in detail. 10

b) Write short notes on:

- i) Network virtualization. 5
- ii) Describe the threats against user access to data. 5

# End Semester Examination, May 2017

## B. Tech.–Fifth Semester COMPUTER GRAPHICS (CS-502A)

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- Define 'aspect ratio'.
  - What are advantages of Bresenham's line drawing algorithm?
  - What do you mean by orthographic projection?
  - What are vanishing points?
  - Define 'window and viewport'.
  - What are perspective projections?
  - What is the advantage of 8-point symmetry?
  - What are the characteristics of random scan display?
  - What is Vertical Retrace?
  - Perform a  $45^\circ$  rotation of triangle A (0, 0), B (1, 1) and C (5, 2) about the origin.  $2 \times 10$

### PART-A

- Q.2
- Discuss and derive an expression for midpoint circle drawing algorithm. Plot a circle using eight-point symmetry with coordinate origin as center and radius of 10 units. 12
  - Scan convert a line from pixel coordinates (1, 1) to (8, 5) using Bresenham's line drawing algorithm. Also discuss advantages and disadvantages of Bresenham's line drawing algorithm. 8
- Q.3
- Discuss any four 2D-transformations along with their matrix representation. 12
  - Discuss Flood-fill algorithm for polygon filling. Also mention its advantages. 4
  - Magnify the triangle with vertices E(1, 2), F (5, 3), G (3, 9) to thrice its size while keeping (3, 9) fixed. 4
- Q.4
- Explain polygon clipping. Discuss Sutherland Hodgeman polygon clipping in detail. 12
  - Find the normalization transformation that maps a window whose lower left corner is at (1, 1) and upper right corner is at (3, 5) onto:
    - Viewport that is entire normalized device screen.
    - Viewport that has lower left corner at (0, 0) and upper right corner  $\left(\frac{1}{2}, \frac{1}{2}\right)$ .  $4 \times 2$

### PART-B

- Q.5
- Discuss anomalies of perspective projections in detail. 10
  - Derive projection matrix for parallel projections. 10
- Q.6
- Explain the properties of Bezier curves in detail. 10
  - Discuss the representation of curves using Hermite Interpolation Method. 10
- Q.7
- Discuss Depth buffer algorithm for hidden surface removal. 12
  - Write notes on:
    - Specular Reflection.
    - Gouraud Shading.  $4 \times 2$

**End Semester Examination, May 2017**  
**B. Tech.–Fifth Semester**  
**COMPONENT BASED PROGRAMMING TECHNOLOGY (CS-503)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) Define .NET framework and Microsoft visual Studio-IDE.
  - b) List out features of applications, that can be developed under the .NET framework.
  - c) Compare the process of boxing and unboxing, giving examples.
  - d) Explain, how you can index an object as an array?
  - e) Explain the usage/purpose of delegates in C#.
  - f) What is the role of JIT compiler?
  - g) Compare Data grid and Data grid view control.
  - h) Write name of namespaces, to be used for windows application development.
  - i) When do we use Hash-table collection for storing data?
  - j) What is the significance of web-based applications? 2 × 10

**PART-A**

- Q.2
- a) Define the concept of "Automatic fall through" in switch-case statement, giving an example. Is it prohibited in C# language? Explain with the help of a program. 5
  - b) Give syntax/example for declaring, creating and initializing 1-d and 2-d arrays in C# language. Also, write a program to compare "for" and "foreach" loop. 5
  - c) List out differences between mutable and immutable strings. Write a program in C#, to perform the following operations on immutable strings:
    - i) Copying string.
    - ii) Concatenating strings.
    - iii) Inserting a sub-string.
    - iv) Extracting a sub-string. 10
- Q.3
- a) How .NET collections are different from traditional data structures? Explain the usage/purpose of the following collections:
    - i) Array list
    - ii) Stack
    - iii) Queue
 Also give syntax/example for adding elements and removing an element from the above mentioned collections. 10
  - b) How you can differentiate Exceptions from compile time errors? Explain giving examples of each. Write a program for system-defined Exception Handling. 5
  - c) Does C# supports multiple inheritance? Comment on this statement. Write a program for implementing multiple interfaces by a single class. 5
- Q.4
- a) Draw neat diagram for .NET architecture. Explain the role/functions of CLR in .NET framework. Also, discuss the stages of compilation process in .NET framework. 10
  - b) Explain the following:
    - i) Automatic Garbage Collection in .NET.
    - ii) Managed and Unmanaged code.
    - iii) FCL
    - iv) CLS and CTS. 10

**PART-B**

- Q.5 a) Give detailed steps of designing a windows GUI for creating a calculator. Also, write an event handler for performing each type of operation on button click event. 10
- b) Define SDI and MDI. What are MDI applications? Explain giving examples. How to set MDI parent form and MDI child form? 5
- c) What do you mean by Windows Form? Explain the purpose/usage of form controls in windows/web based application development. Differentiate among the following:
- i) Combo box and drop down list control.
  - ii) Check box and Radio button control. 5
- Q.6 a) Explain the role/usage of ADO.NET in windows and web based application development. Discuss the purpose of the following .NET Data objects: Data Set, connection object, command object, Data Reader object and Data Adopter object. 10
- b) Define Data binding with reference to ADO.NET. Discuss two types of data bindings, giving examples. 5
- c) What are the benefits of disconnected data access model as compared to connected model? Compare the two Data Access Architectures. 5
- Q.7 a) Discuss the security Architecture, provided by the .NET framework. Also, explain the four fundamental aspects of implementing security. 10
- b) Explain the following security policies:
- i) Code-Access Security.
  - ii) Role-Based Security. 4 × 2
- c) Explain the concept of assemblies in .NET framework. 2

**End Semester Examination, May 2017**  
**B. Tech.–Fifth Semester**  
**WEB TECHNOLOGY AND CYBER SECURITY (CS-504)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) Differentiate between 'internet' and 'intranet'.
  - b) What is the function of web browser?
  - c) How table is created in HTML?
  - d) What do you mean by 'meta tags'?
  - e) What are hidden fields?
  - f) Expand the acronym 'CGI' with brief explanation.
  - g) Define 'cybercrime'.
  - h) Why document Trail is essential in cyber forensics?
  - i) What do you mean by Identity theft?
  - j) What is XHTML?
- 2 × 5

**PART-A**

- Q.2
- a) What is a search engine? How does work? 10
  - b) What are the various MIME types used? 4
  - c) Explain the working of web browser. 6
- Q.3
- a) Explain absolute and relative links. 5
  - b) Explain the features of XML. 5
  - c) Divide a web page into two horizontal frames. Show a combination of ordered and unordered lists in the upper frame and hyperlinking in the lower frame. 10
- Q.4
- a) Create various dialog boxes in JavaScript. 10
  - b) What are events in JavaScript? Demonstrate event handling with example. 10

**PART-B**

- Q.5
- a) Give an example of forms processing using VB Script. 10
  - b) Distinguish PWS, IIS and Apache Web Servers. 10
- Q.6
- a) List down the various FBI forensics guidelines. 10
  - b) How will you secure the evidence? 5
  - c) How can evidence be found in system logs? 5
- Q.7
- a) Explain cyber laws with their scope and coverage. 10
  - b) Explain why protection from cybercrimes is needed. 10

**End Semester Examination, May 2017**  
**B. Tech.–Fifth Semester**  
**CLOUD COMPUTING ARCHITECTURE (CS-521)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

*Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) What is rapid provisioning?
  - b) What is zero client?
  - c) Define mashup.
  - d) Give characteristics of IaaS.
  - e) Define green LT.
  - f) What is SOA?
  - g) Define 'anchored life cycle'.
  - h) Describe on write and out rowed private cloud.
  - i) Differentiate between 'service arbitrage' and 'service aggregator'.
  - j) Name the four components of cloud taxonomy. 2x10

**PART-A**

- Q.2
- a) How is agent cloud computing different from a traditional one and how does it benefit our industries? 10
  - b) Explain briefly; how cloud service providers render provide services and how the customers are charged for these services. 10
- Q.3
- a) Explain why industries are renting their infrastructure for having their websites? 5
  - b) Define and explain briefly the following terms:
    - i) virtualization    ii) cloud bursting    iii) multi – tenancy    iv) resource pooling
    - v) Amazon cloud watch 15
- Q.4
- a) Discuss a case study on salesforce.com. 10
  - b) What is PaaS? Explain the different components and characteristics of PaaS. 10

**PART-B**

- Q.5
- a) Name any five service providers of SaaS and briefly explain the services of each. 5
  - b) Explain the enabling and management tools as a service supported by SaaS. 10
  - c) SaaS may or may not be the best option. Give your comments. 5
- Q.6
- a) Distinguish between security and privacy provided by NIST CCRA model. 10
  - b) Explain various components of cloud service management of NIST CCRA model. 10
- Q.7
- Write a short note on the following:
- a) Business support system 10
  - b) Security, Resilience and Performance consumption. 10

# End Semester Examination, May 2017

B. Tech.–Fifth Semester

## SOFTWARE ENGINEERING AND DEVELOPMENT PROCESS (CS-522)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- What is difference between associations and aggregation? Explain with example.
  - Explain swim lanes and its role in activity diagram in detail with example.
  - What do you understand by package? Explain the significance of packages in modeling the classes.
  - How can we do consistency checking while making the model homogeneous? 5x4

### PART-A

- Q.2
- Discuss the spiral model in detail. 12
  - Explain the advantages of object oriented methodologies over traditional methodologies for development of software. 8
- Q.3
- What are the various development states in object oriented software development process? Explain. 10
  - Draw a use case diagram for Literacy management system. 10
- Q.4
- Depict how can we draw classes, attributes operations in a class diagram? Draw a class diagram for performing various operations of ATM. 15
  - Define following:
    - Inheritance
    - Multiplicity indicator
    - Role name
 5

### PART-B

- Q.5
- What is interaction diagram? What are the different types of interaction diagram? Explain with the help of an example. 12
  - Explain following:
    - Association classes
    - State transition diagram
 8
- Q.6
- What is the need for system architecture? What are the different views of architecture? Explain in detail. 15
  - What is the significance of continuing the classes and splitting the classes while making the model homogeneous? Explain. 5
- Q.7
- Explain the iteration planning process in detail. 10
  - What is the role of design classes in designing the user interface? Discuss. 10

**End Semester Examination, May 2017**  
**B. Tech.–Sixth Semester**  
**BUSINESS PROCESS MANAGEMENT (CS-605)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Briefly answer:

- a) What is inter organization process?
- b) What is degree of repetition?
- c) Differentiate between activity and event.
- d) What is linked process?
- e) What is Gateway?
- f) Differentiate between user lane and system lane.
- g) Explain 'process designer'.
- h) What is BPD?
- i) What is coach?
- j) Explain the role of inspector in process designer.

2 × 10

**PART-A**

- Q.2 a) Explain the classification of business process. 10  
b) What is abstraction? Differentiate between horizontal and vertical abstraction. 10
- Q.3 a) What is business process management? Write and explain the steps of business process management life cycle. 10  
b) Explain in detail business process management architecture in detail. 10
- Q.4 a) Differentiate between input and output variables in BPD by giving suitable examples. 10  
b) Create a BPD to check voter's eligibility using input and output coach. 10

**PART-B**

- Q.5 a) What do you understand by business object? Create a BPD to calculate income tax of an employee using BO. 12  
b) Explain the role of script in creating BPD in process designer. 8
- Q.6 a) What is decision service? How will you use the decision service to calculate the premium amount of an insurer? 12  
b) Differentiate between 'data mapping' and 'data mining'. 8
- Q.7 a) Create a process model for the equipment rental process in detail. 8  
b) Model the following fragment of a business process for assessing loan applications:  
A loan application is approved if it passes two checks:  
i) The applicant's loan risk assessment done automatically by a system, and  
ii) The appraisal of the property for which the loan has been asked, carried out by a property appraiser. The risk assessment requires a credit history check which is performed by a financial officer. After both these checks, a loan officer can assess the eligibility of the applicant for the loan. If the applicant is not eligible, the application is rejected otherwise the acceptance pack is prepared and sent to the applicant. 12



## End Semester Examination, May 2017

B. Tech.— Sixth Semester

BCA / MCA / B. Com. (Hons.) / B. Com (Hons.-II) / BBA (GENERAL) / BBA  
(BANKING) / BBA (G) IB—Fourth Semester / Sixth Semester  
**BUSINESS PROCESSES (CS-610)**

Time: 2 hrs.

Max Marks: 50

No. of pages: 1

Note: *Attempt FIVE questions in all; PART-A is compulsory. Attempt any FOUR questions from PART-B. Each question carries equal marks.*

### **PART-A**

- Q.1    a) List at least Three Cross Industry or Industry applications of SAP.  
        b) What does "R" 4 "3" symbolizes in R/3 system?  
        c) List few components of SAP Net weaver.  
        d) List all the information mentioned on 'status bar of a SAP system'.  
        e) What is meant by Master Data? Give an example.  
        f) How can a billing document be created in SAP system?  
        g) What is meant by Product Lifecycle Management?  
        h) List benefits drawn from effective procurement.  
        i) What is the significance of Business Intelligence Tool?  
        j) What is the primary source for management accounting? 1 × 10

### **PART-B**

- Q.2    Explain in detail SAP ERP system and the various solutions it incorporates. Also explain different products offered by SAP. 10
- Q.3    State the purpose of organizational Structure in SAP system. Using a diagram, explain every element involved in organizational structure. 10
- Q.4    Explain how SAP ERP supports key process in sales order management. 10
- Q.5    Explain in detail the tasks associated with a procurement cycle in SAP. 10
- Q.6    What is General Ledger Accounting in SAP Financials? Explain with the help of diagram, various tasks in Financial Accounting in SAP. 10
- Q.7    Differentiate between OLTP and OLAP environment. Also, describes the advantages of SAP Net Weaver System. 10

**End Semester Examination, May 2017**  
**B. Tech. (Cloud Computing)–Sixth Semester**  
**CLOUD DEVELOPMENT MODEL (CS-622)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1 a) What are the advantages and disadvantages of cloud serviced deployment?  
 b) Define cloud computing with an example. Also list its advantages.  
 c) What is cloud interoperability? Discuss its need in brief.  
 d) What is a third party cloud service? Give some examples.  
 e) What is "VENDOR LOCK – IN" concept? Explain it using cloud interoperability and standards. 4x5

**PART-A**

- Q.2 a) What are the various cloud computing deployment models? Explain. 10  
 b) What makes cloud computing so interesting to IT stakeholders and research practitioners? Explain it by listing cloud computing service requirements. 10
- Q.3 a) What are be the parameters that an organization considers before opting for a private cloud? 10  
 b) Write a brief note on the private cloud – "VMW are Vcloud". 10
- Q.4 a) What is a public cloud? Give some examples. Differentiate between public and private cloud in detail. 10  
 b) Explain the limitations of public cloud in terms of :  
     i) Low degree of security and control.  
     ii) Network latency.  
     iii) Highest long term cost. 10

**PART-B**

- Q.5 a) List and explain major keypoints that a 'Service Level Agreement (SLA)' should contain. 10  
 b) What are the terminations or exit policies that cloud provider should include in SLA? 10
- Q.6 a) What are the steps that an organization should consider before migrating its infrastructure to a hybrid cloud? 10  
 b) Explain why a hybrid cloud becomes essential for an organization and how the hybrid workloads can be developed and managed? 10
- Q.7 a) Describe openstack. Explain the benefits of using Openstack cloud in detail. 8  
 b) Define 'identity service' in openstack in brief. 4  
 c) Explain the modular architecture of openstack in detail. 8

**End Semester Examination, May 2017**  
**B. Tech.—Sixth / Seventh Semester**  
**COMPILER DESIGN (CS-701)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1 a) Differentiate between parse tree and syntax tree. Construct parse tree and syntax tree for  $(6 \times 8 + 2) * 2$ .  
 b) What are error-recovery techniques in LR parsing?  
 c) What is Left Recursion? Explain how you eliminate it with the help of an example?  
 d) Consider the following grammar:

$$S \rightarrow a A c B e$$

$$A \rightarrow A b | b$$

$$B \rightarrow d$$

And consider the string  $w \rightarrow a b b c d e$

Show the process of Handle Pruning.

- e) What are compiler construction tools?

5 × 4

**PART-A**

- Q.2 a) What are syntax and semantic errors? 5  
 b) What are various parameter transmission schemes? Explain with examples. 10  
 c) Distinguish between static and dynamic scope. 5
- Q.3 a) Explain input buffering scheme for scanning the source program. 10  
 b) Construct minimized DFA for  $a b b (a / b)^* b^*$  using  $\epsilon$ -closure mechanism. 10
- Q.4 a) Construct predictive parsing table for the following grammar and check whether the grammar is LL(1) or not:  
 $S \rightarrow i C t S S^1 | a$   
 $S^1 \rightarrow e S | \epsilon$   
 $C \rightarrow b$  10  
 b) What is parsing? Differentiate between top-down and bottom-up parsers in detail. 10

**PART-B**

- Q.5 a) What is syntax direct translation scheme and how it is implemented? Explain with an example. 10  
 b) Explain various types of intermediate code representations in detail. 10
- Q.6 a) What is symbol table? Explain how do you implement it by using linear list and hash tables. 10  
 b) What are semantic phase errors and its error recovery techniques? 10

- Q.7 a) Explain various issues in code generation and generate code sequence for the following:

$$A = B - C$$

$$Z = B - D$$

$$P = A + Z$$

$$Q = R + Z$$

- b) What is directed acyclic graph (DAG)? Construct DAG for the following basic block:

$$a = b + c$$

$$t1 = a * a$$

$$b = t1 + a$$

$$c = t1 * b$$

$$t2 = c + b$$

$$a = t2 + t2$$

10×2

**End Semester Examination, May 2017**  
**B. Tech. – Sixth Semester**  
**STRENGTH OF MATERIALS (CS-701)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1
- Differentiate Inherited and Synthesized attributes.
  - List various compiler construction tools.
  - Define Ambiguous Grammar.
  - What is DAG? Mention its applications.
  - Write characteristics of a good programming language.
  - What is code motion? Explain.
  - Define deterministic Finite Automata.
  - Mention the types of LR Parser.
  - What is a basic block in code optimization?
  - Write benefits of Intermediate Code Generation.
- 2x10

**PART-A**

- Q.2
- How sequence is controlled between statements? 10
  - Explain different parameter transmission schemes in detail. 10
- Q.3
- Write a LEX program that recognize the following:
    - if, else then, begin, end.
    - relational operators <, >, <=, >=
    - Identifier.10
  - Explain different phases of compiler with the help of block diagram. 7
  - Distinguish between phases and passes. 3
- Q.4
- Construct LALR parsing table for the following grammar:
 

$S \rightarrow AA$   
 $A \rightarrow aA$   
 $A \rightarrow b$

15
  - What are limitations of SLR parser? 5

**PART-B**

- Q.5
- Write three address codes for:  
 $q = -b(d+c) + (-b)*d$   
 and also place the generated code in Triplets, Indirect Triplets and Quadruples 12
  - Define syntax directed translation and explain its scheme. 8
- Q.6
- Explain different types of Error Recovery Techniques. 10
  - Define symbol table and explain how linked list and hash tables are used to represent symbol table. 10
- Q.7
- Write short note on:
- Code generation. 7
  - Loop optimization. 7
  - Register allocation for temporary variables. 6

**End Semester Examination, May 2017**  
**B. Tech.– Sixth / Seventh Semester**  
**SOFTWARE DEVELOPMENT PROCESSES (CS-702)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Answer the following in brief:

- a) Define an interface.
- b) What is the application domain of UML?
- c) Define multiplicity of a relationship.
- d) What is a scenario?
- e) Define an interaction.
- f) Explain the concept of inheritance using an example.
- g) Write the various notations used to specify an object.
- h) Why do we need to document the iteration?
- i) Define collaboration.
- j) What are models? Why do we need modeling?

2 × 10

**PART-A**

- Q.2 a) Discuss the object-oriented S/W development process w.r.t. process domain. 10  
 b) Critically examine the V-shape and incremental models of S/W development. 10
- Q.3 a) Draw and explain the activity diagram for students registration system. 10  
 b) What are the components of use-case diagram? Explain using a simple example. 10
- Q.4 Explain the following using suitable examples:  
 a) Generalization relationship.  
 b) Difference between aggregation and association.  
 c) Reflexive relationship.  
 d) Dependency relationship. 5 × 4

**PART-B**

- Q.5 a) Draw and elaborate a collaboration diagram for ATM machine. 10  
 b) What is a design class? Explain in detail. 10
- Q.6 a) Why so we need to homogenize the model? Discuss the various techniques used. 10  
 b) What are patterns? Discuss in detail. 10
- Q.7 a) Discuss in detail the 4+1 view of system architecture. Explain the purpose and function of each of its components? 10  
 b) Explain in detail the process of coding, testing and documenting the iterations. What is its significance? 10

**End Semester Examination, May 2017**  
**B. Tech.– Sixth / Seventh Semester**  
**SYSTEM PROGRAMMING AND SYSTEM ADMINISTRATION(CS-703)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) What are text editors?
  - b) Discuss any four assembly mnemonics.
  - c) Why assemblers are required?
  - d) What is the function of UNIX editors?
  - e) What are wild cards?
  - f) Discuss any two file operations.
  - g) Discuss the booting process in detail.
  - h) What are drivers?
  - i) Discuss conditional macro expansion.
  - j) What are inodes?
- 2 × 10

**PART-A**

- Q.2
- a) Discuss basic MACRO processor functions in detail. 12
  - b) What are debug monitors? Explain in detail. 8
- Q.3
- a) Explain 2 pass assemblers in detail. 12
  - b) Discuss design of linker. What is dynamic binder? 8
- Q.4
- a) Show UNIX architecture with diagrams and discuss in detail. 12
  - b) How absolute path name and relative path name are different? Discuss. 8

**PART-B**

- Q.5
- a) Write a shell script to check even or odd number.
  - b) Discuss UNIX directory and files. Also explain directory structure in UNIX. 10 × 2
- Q.6
- a) What is file system? Explain partitioning in file system in detail.
  - b) Discuss user management in system administration in detail. 10 × 2
- Q.7
- a) What is the difference between system software and application software?
  - b) Discuss virus control management. 10 × 2

# End Semester Examination, May 2017

B. Tech.–SixthSemester

## SYSTEM PROGRAMMING AND SYSTEM ADMINISTRATION (CS-703)

Time: 3 hrs.

Max Marks:100

No. of pages:1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Briefly answer:

- a) What are dynamic binders?
- b) Define pipeline and filters.
- c) What are the 3 modes of Vi?
- d) Differentiate between system software and application software.
- e) Define the function of Absolute loader?
- f) What are shell variables?
- g) Difference between standard Input and standard output.
- h) What are the functions of driver?
- i) Define basic operations on file.
- j) Difference between absolute and relative pathname.

2 × 10

### PART-A

Q.2 a) What is Macro? Explain Macro Instruction arguments.

10

b) Discuss followings:

i) Text editors.

ii) Conditional Macro expansion.

5 × 2

Q.3 a) Briefly explain the machine dependent features of assembler.

5

b) Explain the design of one pass assembler with the help of flowchart.

10

c) What are loaders? Write down its features.

5

Q.4 a) Write a short notes on:

i) Blocks and fragments.

ii) Inodes.

5 × 2

b) Write down the user-to-user communication commands.

10

### PART-B

Q.5 a) Explain the comparing and sorting files commands with the help of an example.

7

b) What are shell variables?

5

c) Discuss the following:

i) Wild cards.

ii) Shell programming constructs.

4 × 2

Q.6 a) What are the basic role and responsibility of system administrator?

5

b) Write down the user management commands.

5

c) Write down the syntax to remove user and to give permissions to users.

5

d) Define the syntax for changing permission modes on files.

5

Q.7 a) How virus management control is done in operating system?

10

b) Write short notes on:

i) I/o Devices.

ii) Drivers.

5 × 2



**End Semester Examination, May 2017**  
**B. Tech.— Sixth Semester**  
**NETWORK SECURITY AND MANAGEMENT (CS-721)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) Differentiate between 'passive attacks' and 'active attack'.
  - b) What is 'denial of service attack'?
  - c) Explain the purpose of S-box in DES.
  - d) What is triple encryption?
  - e) Define 'honeypot'.
  - f) Differentiate between 'block cipher' and 'stream cipher'.
  - g) What are limitations of firewall?
  - h) Define the 'basic principle of public key cryptosystem'.
  - i) Give the major strength of RSA.
  - j) Define 'PGP (Pretty Good Privacy)'. 2 × 10

**PART-A**

- Q.2
- a) What is the difference between 'substitution cipher' and 'transposition cipher'? Explain by giving an example of each one. 10
  - b) What is encryption? What is decryption? Draw a block diagram showing plaintext, ciphertext, encrypted message and decrypted message. 10
- Q.3
- a) Explain the avalanche effect. 5
  - b) Show that DES decryption is in fact the inverse of DES encryption. 10
  - c) How does the cipher feedback mode work for the purpose of encryption and decryption? 5
- Q.4
- a) what are the key principle of security? 5
  - b) Explain password management scheme in detail. What are the basic technique for generating non-guessable password. 10
  - c) Explain the life cycle of virus. 5

**PART-B**

- Q.5
- a) What is message authentication code? What is the difference between MAC and a one way hash function? 10
  - b) Explain SHA in detail. 10
- Q.6
- a) Explain SSL handshake protocol.
  - b) How does SET protect payment information from the merchant?
- Q.7
- a) Write short notes on:
    - i) SNMPV1.
    - ii) Network management model. 10 × 2

**End Semester Examination, May 2017**  
**B. Tech.—Sixth Semester**  
**NETWORK SECURITY AND MANAGEMENT (CS-721A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Briefly answer:

- a) What is the purpose of S-box in DES?
- b) Explain triple DES with EDE mode.
- c) What is the advantage of using asymmetric key cryptography?
- d) Define the term: 'replay attack'.
- e) What is digital signature?
- f) What are the limitations of firewall?
- g) Distinguish between 'virus' and 'worm'.
- h) What is non-repudiation in attacks?
- i) Explain major strength of RSA.
- j) What is the requirement of hash function?

2 × 10

**PART-A**

- Q.2 a) What are the key principles of security? Explain with example. 10  
b) Discuss the concept of play-fair cipher. What is the output of plaintext "Hello"? If the key used is "Monarchy" to encode it. 10
- Q.3 a) What is the difference between stream cipher and blocks cipher? Explain the encryption and decryption of ECB mode. 10  
b) What is meet-in-middle attack in double DES? 5  
c) How can the same key be used in triple DES? 5
- Q.4 a) Explain how Differ-Hellman-key exchange algorithm provides security in sharing of keys with example. 10  
b) How RSA can be used for performing digital signature? 10

**PART-B**

- Q.5 a) What do you mean by MAC? How does MAC works? 5  
b) Distinguish between 'MDS' and 'SHA' algorithm. 5  
c) Explain data compression technique in detail. 10
- Q.6 a) Explain password management scheme in detail. What are the basic technique for generating non-guessable password. 10  
b) Give the life cycle of virus. Also explain various types of viruses. 10
- Q.7 Write short notes on (*any two*):  
a) RMON.  
b) TMN.  
c) Kerberos. 10 × 2

**End Semester Examination, May 2017**  
**B. Tech.— Seventh Semester**  
**SOFTWARE TESTING (CS-723)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) Why exhaustive testing is not possible? Explain.
  - b) What is the significance of cyclomatic complexity?
  - c) Differentiate between static and dynamic testing.
  - d) What are the responsibilities of a lead tester?
  - e) What is an independent path?
  - f) Define software quality.
  - g) What are the characteristics of a good test case?
  - h) State an example of user-interface errors.
  - i) What are the problems associated with manual testing?
  - j) Explain stress testing.
- 2×10

**PART-A**

- Q.2
- a) Explain in detail the levels of testing.
  - b) Explain software development life cycle with its stages.
- 10×2
- Q.3
- a) What is problem report? Draw a general problem report form and explain its content.
  - b) What are the tactics for analyzing a reproducible bug and how can be bug ne made reproducible?
- 10×2
- Q.4
- a) What are the objectives of problem tracking system? Also discuss problem tracking overview.
  - b) List users of a tracking system. Explain functions of each in detail.
- 10×2

**PART-B**

- Q.5
- a) Discuss the strategy for developing components of a test planning documents.
  - b) Generate the BVA (Boundary value analysis) test cases for the following:  
 Next date is a function of three variables month, date and year. It returns the date of next day as output. It reads current date as input date. The conditions are:  
 $C1: 1 \leq month \leq 12$   
 $C2: 1 \leq day \leq 31$   
 $C3: 1900 \leq year \leq 2025$   
 If any of the conditions  $C1, C2$  and  $C3$  fails, function output "Invalid".
- 10×2
- Q.6
- a) What is automated testing? Explain load runner briefly.
  - b) Explain automated acceptance and regression testing.
- 10×2
- Q.7
- a) Describe software quality control, quality assurance and cost of quality. Also discuss the software quality assurance activities briefly.
  - b) What is capability maturity model? Explain capability maturity model in detail.
- 10×2

**End Semester Examination, May 2017**  
**B. Tech.—Sixth / Seventh Semester**  
**SOFTWARE TESTING (CS-723A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- Differentiate error, bug, defect, failure and give example of each.
  - What is the need of white-box testing?
  - What is basic path testing?
  - What is the difference between quality management and project management?
  - What is the need of automating the testing activities?
  - Distinguish between 'an inspection' and walkthrough'.
  - Difference between 'conventional testing' and 'object-oriented testing'.
  - Difference between 'alpha' and 'beta testing'.
  - What are the benefits of early testing?
  - Which type of testing is possible with Boundary Value Analysis (BVA) and explain? 2 × 10

**PART-A**

- Q.2
- Explain states of a Bug. 5
  - Explain software testing life cycle (STLC). 5
  - Describe various levels of testing. Illustrate integration and system testing. 10
- Q.3
- Explain the methods of quality management. 5
  - Explain the software quality matrices. 5
  - Explain any two software quality assurance models. 10
- Q.4
- A program reads an integer number within the range [1,100] and determines whether it is prime number or not. Design test cases for this program using BVC, robust testing and worst-case testing methods. 10
  - Explain the characteristics of a good Test. 10

**PART-B**

- Q.5
- Explain the cyclomatic complexity. 10
  - Differentiate 'gamma testing' and 'mutation testing'. 5
  - Explain data flow testing and what are the applications of Path Testing. 5
- Q.6
- Explain the types of Static Testing. 7
  - What are the benefits of inspection process? 3
  - Explain structured walkthroughs. Also, explain the process of walkthrough. 10
- Q.7
- Explain the challenges in testing for web-based software. 10
  - Explain the integration testing and also explain the non-incremental and incremental testing. 10

**End Semester Examination, May 2017**  
**B. Tech.— Seventh Semester**  
**ARTIFICIAL INTELLIGENCE (CS-801)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) What is artificial intelligence? Explain the components of artificial intelligence with a suitable block diagram.
  - b) Define 'Prolog and LISP'. Write the difference between them.
  - c) Define 'heuristic and heuristic function'. Explain the role of heuristic in search problem.
  - d) What are frames?
  - e) What is default reasoning?
  - f) What are intelligent agents? Explain their importance.
  - g) Explain the limitations of monotonic system.
  - h) Explain the procedural v/s declarative knowledge.
  - i) What are the various issues in natural language processing?
  - j) What are the problems of hill climbing algorithm? 2 × 10

**PART-A**

- Q.2
- a) Define the state space for waterjug problem. Is this problem decomposable and ignorable? Justify your answer. 6
  - b) Write and describe AO\* algorithm using a suitable example. 10
  - c) Compare and contrast breadth-first-search and depth-first-search. Explain the technique to overcome the drawback of both. 4
- Q.3
- a) Write a short note on the foundation of artificial intelligence. 10
  - b) Write a program in PROLOG to find the number of items in a list. 5
  - c) Explain Turing test. Why is it done? 5
- Q.4
- a) Consider the following sentences:
    - i) John likes all kinds of food.
    - ii) Apple is food.
    - iii) Chicken is food.
    - iv) Anything anyone eats and isn't killed by is food.
    - v) Bill eats peanuts and is still alive.
    - vi) She eats everything Bill eats.
 Translate these sentences into predicate logic. Using resolution answer the question "What food does she eat"? 10
  - b) Explain knowledge representation using frames and semantic networks in detail. 10

**PART-B**

- Q.5 Explain in detail:
- a) Non-monotonic reasoning.
  - b) Bayesian network. 10 × 2
- Q.6
- a) Explain the architecture of expert system? 5
  - b) What do you mean by PEAS? Explain properties of task environment. 5
  - c) What is an agent? Explain the types of agent? 10

- |     |  |    |
|-----|--|----|
| Q.7 | a) Explain Min-Max algorithm and Alpha-Beta pruning in detail. | 10 |
|     | b) Explain the steps involved in natural languages processing? | 10 |

# End Semester Examination, May 2017

B. Tech.–Seventh Semester

## DIGITAL IMAGE PROCESSING(CS-822)

Time: 3 hrs

Max Marks:100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

- Q.1
- Define 4-connectivity, 8-connectivity and m-connectivity.
  - Define histogram and histogram equalization.
  - Define image smoothing and sharpening.
  - Define spatial averaging.
  - What is median filter? Mention its applications.
  - Why segmentation is required in image processing?
  - What is the principle of inverse filtering?
  - State the conditions for region splitting and merging process.
  - What is pattern filtering approach?
  - State the need for image compression.

2x10

### PART-A

- Q.2
- What are the stages through which an image passes in an image processing system? Explain. 8
  - Explain the principle of sampling and quantization. Discuss the effect of increasing the
    - Sampling frequency
    - Quantization levels on an image.
 12
- Q.3
- What do you mean by image enhancement? What are the different methods of image enhancement? 10
  - Define 2-D DFT and explain its properties. 10
- Q.4
- How an RGB model is represented using HIS format? Describe the transformation. 7
  - Discuss about the inverse filtering and weiner approach for image restoration. 7
  - Specify the expression for the following filters.
    - Geometric mean filter.
    - Harmonic mean filter.
    - Contra harmonic mean filter.
 6

### PART-B

- Q.5
- Discuss the algorithm for the following operations:
    - Edge detection.
    - Boundary detection.
 8
  - A source emits letters from an alphabet  $A = \{a_1, a_2, a_3, a_4, a_5\}$  with probabilities  $P(a_1)=0.2; P(a_2)=0.4; P(a_3)=0.2; P(a_4)=0.1$  and  $P(a_5)=0.1$ .
    - Find a huffman code for this source.
    - Find the average length of the code and its redundancy.
 12
- Q.6
- What is the need of pattern recognition? What are the different approaches for pattern recognition? 10
  - Differentiate between a region and a boundary. Describe boundary descriptors in detail. 10
- Q.7 Write short notes on (*any two*):
- Applications of image processing.

- b) Region descriptors.
- c) Lossless and lossy compression.

**10x2**



**End Semester Examination, May 2017**  
**B. Tech.–Fifth Semester**  
**DISTRIBUTED OPERATING SYSTEM(CS-825)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1 a) Define term 'Group Communication'.  
 b) Explain clock synchronization.  
 c) Explain the terms: 'deadlock prevention' and 'deadlock detection' in detail.  
 d) What are the various causes of deadlock? 5x4

**PART-A**

- Q.2 a) Differentiate between logical clocks and physical clocks. How are both useful in distributed systems? 10  
 b) Compare and contrast the terms: centralized algorithms, distributed algorithms, token ring algorithms. 10
- Q.3 a) Define term 'concurrency control'. Explain term locking in concurrency control with an example. 10  
 b) What are Remote Procedure calls? Explain in detail. 10
- Q.4 a) Define term 'threads' in detail. Explain various threads packages used in distributed systems. 10  
 b) Explain term 'processes' and 'processors in distributed system'. 10

**PART-B**

- Q.5 a) Explain page-based distributed shared memory in detail. 10  
 b) Discuss various design issues in distributed file system. 10
- Q.6 Write short notes on:  
 a) MACH. 10  
 b) UNIX emulation in MACH. 10
- Q.7 a) What is the role of consistency in distributed systems? Explain various models used to maintain consistency in distributed systems. 10  
 b) Explain terms: 'Shared variable' and 'Shared memory'. 10

**End Semester Examination, May 2017**  
**B. Tech.–Fifth Semester**  
**DISTRIBUTED OPERATING SYSTEM(CS-825)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1    a) Define term 'Group Communication'.  
        b) Explain clock synchronization.  
        c) Explain the terms: 'deadlock prevention' and 'deadlock detection' in detail.  
        d) What are the various causes of deadlock? 5x4

**PART-A**

- Q.2    a) Differentiate between logical clocks and physical clocks. How are both useful in distributed systems? 10  
        b) Compare and contrast the terms: centralized algorithms, distributed algorithms, token ring algorithms. 10
- Q.3    a) Define term 'concurrency control'. Explain term locking in concurrency control with an example. 10  
        b) What are Remote Procedure calls? Explain in detail. 10
- Q.4    a) Define term 'threads' in detail. Explain various threads packages used in distributed systems. 10  
        b) Explain term 'processes' and 'processors in distributed system'. 10

**PART-B**

- Q.5    a) Explain page-based distributed shared memory in detail. 10  
        b) Discuss various design issues in distributed file system. 10
- Q.6    Write short notes on:  
        a) MACH. 10  
        b) UNIX emulation in MACH. 10
- Q.7    a) What is the role of consistency in distributed systems? Explain various models used to maintain consistency in distributed systems. 10  
        b) Explain terms: 'Shared variable' and 'Shared memory'. 10

**End Semester Examination, May 2017**  
**B. Tech.— Seventh Semester**  
**DISTRIBUTED OPERATING SYSTEM (CS-825)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) Explain group Communication.
  - b) Discuss co-scheduling for distributed operating system.
  - c) What is meant by a single system image?
  - d) Differentiate between MIMD and SIMD.
  - e) What is meant by an open system? Why it is not open?
  - f) Does using time stamping for concurrency control ensure serializability? Discuss.
  - g) Name two useful properties that immutable files have.
  - h) Why do distribute system use two level naming?
  - i) What are threads?
  - j) A multiprocessor has single bus. Is it possible to implement strictly consistent memory? 2 × 10

**PART-A**

- Q.2
- a) What is the main difference between a distributed operation system and network operating system? 8
  - b) What are the primary tasks of a microkernel? What are the advantages of microkernel over monolithic kernel? 6
  - c) Explain the concept of parallelism transparency. 6
- Q.3
- a) Explain the election algorithm in detail with the help of bully and ring algorithm. 8
  - b) Write a short note on 'atomic transactions'. 6
  - c) Explain distributed deadlock prevention and detection in detail. 6
- Q.4
- a) How the threads are organized in a process? Discuss in detail. 8
  - b) What are the various system models used in distributed system? Explain in detail. 6
  - c) Discuss scheduling in distributed system. 6

**PART-B**

- Q.5
- a) Differentiate between file service using the upload/download model and one using the remote access model. 8
  - b) Discuss the distributed file system implementation in detail. 8
  - c) A file is replicated on 10 servers. List all the combinations of read quorum and write quorum that are permitted by the voting algorithm. 4
- Q.6
- a) What are various consistency models in distributed shared memory? 8
  - b) Explain the page based distributed shared memory in detail. 8
  - c) Why is the concept of "home memory" needed in memnet but not in dash? 4
- Q.7
- a) Discuss process management in MACH. 8
  - b) Explain UNIX emulation in MACH. 6
  - c) Write a short note on 'communication in MACH'. 6

**End Semester Examination, May 2017**  
**M.Tech. (CSE) -First Semester**  
**ADVANCED COMPUTER NETWORKS(CS-M-102)**

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: *Attempt anyFIVE questions in all. Each question carries equal marks.*

- |     |   |   |
|-----|---|---|
| Q.1 | a) Explain the difference between pure aloha and slotted aloha.   | 5 |
|     | b) Explain the types of network devices in detail.  | 5 |
|     | c) Compare TCP/IP and OSI reference model.  | 5 |
| Q.2 | a) Explain by means of a diagram, the cell format using within an ATM network.  | 5 |
|     | b) What is the difference between a virtual path and a virtual channel?   | 5 |
|     | c) What is Lan emulation? Explain.  | 5 |
| Q.3 | a) Can one set up a gateway to the internet that translates IP addresses, so that he does not have to change all our interval address to an official network?                     | 5 |
|     | b) What is difference between subnet and supernet? Discuss with an example.   | 5 |
|     | c) Discuss IPv6 in detail.  | 5 |
| Q.4 | a) Briefly explain the addressing mechanism of ATM.   | 8 |
|     | b) ATM traffic contracts form part of the mechanism by which "quality of service" (QoS) is ensured. What are four types which have a set of parameters describing the connection? | 7 |
| Q.5 | a) What is the difference between B- ISDN and ISDN? Explain the basic services of ISDN. Describe five applications of ISDN.   | 8 |
|     | b) Describe the frame format used by the Ethernet. And also compare it with GB Ethernet.  | 7 |
| Q.6 | a) Why does connect() succeed even before my server did an accept()?  | 5 |
|     | b) When can one replace his cell phone with a VOIP phone?   | 5 |
|     | c) How does VOIP work?  | 5 |
| Q.7 | a) Explain any five issues associated with transport control protocol.  | 7 |
|     | b) Explain the TCP connection management.   | 8 |
| Q.8 | a) What are the steps involved in socket programming?   | 5 |
|     | b) Compare IPv4 and IPv6 protocol architectures.  | 5 |
|     | c) Explain GPRS in detail.  | 5 |

**End Semester Examination, May 2017**  
**M. Tech. (CSE)—First Semester**  
**ADVANCE OPERATING SYSTEMS (CS-M-103)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 1

Note: *Attempt ANY FIVE questions in all. Each question carries equal marks.*

- Q.1 a) Write in brief about the following operating systems to highlight their differences:  
 i) N/W operating system.  
 ii) True distributed systems.  
 iii) Multiprocessor timesharing system. 2 × 3  
 b) Discuss the various design issues governing the design of distributed operating systems. 9
- Q.2 a) Suggest suitable examples to illustrate the difference between the functioning of blocking versus non-blocking primitives. 7  
 b) Explain in detail the parametric passing scheme used in RPC. 8
- Q.3 a) Explain how the following algorithms guarantee mutual exclusion in case of multiple processors:  
 i) Token ring algorithm.  
 ii) Centralized algorithm. 3 × 2  
 b) Explain various algorithms that have been suggested for distributed deadlock detection. 9
- Q.4 a) What issues need to be addressed for the design and implementation of thread package? Explain each in detail. 10  
 b) What is graph-theoretic deterministic algorithm used for? Explain. 5
- Q.5 Explain the following consistency models:  
 a) Strict consistency.  
 b) Sequential consistency.  
 c) Casual consistency.  
 d) PRAM consistency.  
 e) Release consistency. 3 × 5
- Q.6 a) Explain the usage and implementation of access matrix model in detail. 9  
 b) Why is resource security required? Explain. 6
- Q.7 a) Discuss the various election algorithms used for coordinator selection in detail. 8  
 b) What are the features of a message passing system? Explain. 7
- Q.8 a) Explain why systems having distributed shared memory prefer to use write-invalidate in place of write-update for casting. 7  
 b) What are the various services offered by DCE? Explain. 8

**End Semester Examination, May 2017**  
**M.Tech. (CSE) -First Semester**  
**OBJECT ORIENTED MODELING AND DESIGN(CS-M-105)**

Time: 3 hrs

Max Marks: 75

No. of pages:

Note: *Attempt anyFIVE questions in all. Each question carries equal marks.*

- Q.1 a) Draw event trace diagram for issue and return of books from library. 7  
 b) Define aggregation. Explain types of aggregation with the help of a suitable example. 8
- Q.2 a) How aggregation is different from composition. Explain it with an example. 5  
 b) Prepare a class diagram for a graphical document editor that supports grouping. Assume that a document consist of several sheets. 10
- Q.3 a) Explain basic components of UML by taking suitable examples. 7  
 b) Explain the steps for modeling a use case diagram. Draw use case diagram for modeling purchasing goods from super market. 8
- Q.4 a) Explain the differentiation between collaboration diagram and sequence diagram with the help of an example. 8  
 b) Explain how structural relationships can be modeled using class diagrams by taking an appropriate example? 7
- Q.5 a) What are basic building blocks of UML? Explain each with a suitable example. 7  
 b) Prepare a class diagram for a library book checkout system that shows the late charges for an overdue book as a derived attribute. 8
- Q.6 a) What is software development process? Enlist steps of software development process? Differentiate between iterative process model from waterfall model. 8  
 b) Explain the purpose of activity diagram? In which situation activity diagram is not necessary? Explain the use of following concepts for activity diagram: Synchronization bar, swimlane and sending – receiving signals. 7
- Q.7 Prepare object model, dynamic model and functional model for ATM banking system. 15
- Q.8 Write short notes on:  
 a) Robustness.  
 b) Reusability.  
 c) Extensibility. 5x3

**End Semester Examination, May 2017**  
**M.Tech. (CSE) -First Semester**  
**CLOUD COMPUTING(CS-M-108)**

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: *Attempt anyFIVE questions in all. Each question carries equal marks.*

- |     |  |    |
|-----|--|----|
| Q.1 | a) What is SaaS in cloud computing? Discuss in detail.   | 9  |
|     | b) Explain any six benefits of SaaS in detail with the help of examples.                                 | 6  |
| Q.2 | a) What is the need for virtualization? Compare and contrast a scenario before and after virtualization. | 8  |
|     | b) Explain different operational and economical benefits of using cloud.                                 | 7  |
| Q.3 | a) Discuss the migration issues of the organization towards cloud.                                       | 8  |
|     | b) Discuss the cloud computing challenges in detail.   | 7  |
| Q.4 | a) List and explain various cloud computing security challenges.   | 8  |
|     | b) Discuss IAM security feature in detail.   | 7  |
| Q.5 | Discuss the following technologies in detail:  |    |
|     | a) Anetra.   | 8  |
|     | b) Hadoop.   | 7  |
| Q.6 | Discuss local and remote replication technologies as a part of business continuity.                      | 15 |
| Q.7 | a) What is the difference between process virtual machines, host VMMs and native VMMs.                   | 9  |
|     | b) Explain in brief; how cloud helps reducing capital expenditure?                                       | 6  |
| Q.8 | a) Explain services provided by Amazon infrastructure cloud from user perspective.                       | 9  |
|     | b) What is self service provisioning?  | 6  |

**End Semester Examination, May 2017**  
**M. Tech. (CSE)–Second Semester**  
**ADVANCED COMPUTER ARCHITECTURE (CS-M-201)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 2

Note: Attempt any FIVE questions in all. Each question carries equal marks.

- Q.1** Answer the following questions on program flow mechanism and computer models:
- Compare control-flow, data-flow, and reduction computers in terms of program flow mechanisms used.
  - Comment on the advantages and disadvantage in control complexity, potential for parallelism and cost effectiveness of computer models as in 1(a) above.
  - What are the differences between string reduction and graph reduction machines?  $5 \times 3$
- Q.2** a) Define the following terms related to parallelism and dependence relations:
- Bernstein condition.
  - Computational granularity.
  - Communication latency.  $3 \times 3$
- b) Analyze the data dependence among the following statements in a given program:
- $$S_1 : X \leftarrow (A + B) \times (A - B)$$
- $$S_2 : Y \leftarrow (C + D) / (C - D)$$
- $$S_3 : Z \leftarrow X + Y$$
- $$S_4 : A \leftarrow E \times F$$
- $$S_5 : Y \leftarrow E - Z$$
- $$S_6 : B \leftarrow (X - F) \times A$$
- 6**
- Q.3** a) For a direct-mapped cache design with a 32-bit address and byte addressable memory, the following bits of addresses are used to access the cache.
- Main memory size = 16 KB.
  - Cache size = 256 B.
- Calculate the number of Tag bits and Tag Directory size.  
 Also calculate the number of tag bits and tag directory size for fully associative cache design. **6**
- b) Compare the relative merits of four cache memory organizations:
- Direct mapping cache.
  - Fully associative cache.
  - Set associative cache. **9**
- Q.4** Explain the following terms associative with cache design:
- "Write through" vs "write back caches".
  - "Cacheable" vs "non-cacheable data".
  - "Private caches" vs "shared caches".
  - Cache flushing policies.
  - Factors affecting cache hit ratios. **3 \times 5**
- Q.5** Consider the following reservation table for a four stage pipeline with a clock cycle of  $J = 20\text{ns}$ .
- What are the forbidden latencies and the initial collision vector?
  - Draw the state diagram for scheduling the pipeline.
  - Determine the MAL associated with the shortest greedy cycle.
  - Determine the pipeline throughput corresponding to the MAL and given J.



e) Determine the lower bound on the MAL for this pipeline.

	1	2	3	4	5	6
S1	X					X
S2		X		X		
S3			X			
S4				X	X	

15

Q.6 Explain the following terms associated with multicomputer networks and message passing mechanisms:

- Message, packets, flits.
- Store and forward routing at packet level.
- Wormhole routing at flit level.
- Virtual channels vs physical channels.
- Buffer dead lock vs channel deadlock.

3×5

Q.7 Explain cache coherence protocols for maintaining cache coherency in multiprocessor architecture.

15

Q.8 a) Explain vector access memory schemes for multicomputer architecture.

6

b) Explain different types of multiprocessor system interconnect for multiprocessor system.

9

**End Semester Examination, May 2017**  
**M. Tech.— Second Semester**  
**NETWORK ADMINISTRATION AND SECURITY (CS-M-202)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 1

Note: *Attempt ANY FIVE questions in all. Each question carries equal marks.*

- |     |  |       |
|-----|--|-------|
| Q.1 | a) What is security policy? Explain security policy enforcement considerations.                                | 7     |
|     | b) Explain security system operation life cycle in detail.   | 8     |
| Q.2 | a) Explain any two read and redirect attacks in detail.  | 7     |
|     | b) Differentiate between:  |       |
|     | i) RADIUS and TACACS+  |       |
|     | ii) Smart cards and Biometrics   | 4 × 2 |
| Q.3 | a) Explain MAC flooding consideration with respect to L2 switch?   | 8     |
|     | b) Explain the hardening of switch.  | 7     |
| Q.4 | a) State the network security best practices for firewall.   | 7     |
|     | b) Explain the design consideration for DNS.   | 8     |
| Q.5 | a) What are the topology choices for VPN? Discuss.   | 8     |
|     | b) Differentiate the transport and tunnel mode of IP SEC.  | 7     |
| Q.6 | a) Explain the protocol capabilities for following protocols:  |       |
|     | i) SNMP.   |       |
|     | ii) Syslog.  | 4 × 2 |
|     | b) Explain Clear-Text-Inband and Cryptographicallysecureinband, Secure management design techniques in detail. | 7     |
| Q.7 | a) Discuss the roles and procedures at digital crime scenes.   | 8     |
|     | b) How can we track a fake email? Explain in detail.   | 7     |
| Q.8 | Explain the following:   |       |
|     | a) HIDS and NIDS.  |       |
|     | b) Proxy Server.   |       |
|     | c) VLAN Hopping Consideration.   | 5 × 3 |

**End Semester Examination, May 2017**  
**M. Tech.–SecondSemester**  
**ADVANCED DATABASE MANAGEMENT SYSTEMS (CS-M-203)**

Time: 3 hrs.

Max Marks:75

No. of pages:1

Note: *Attempt anyFIVE questions in all. Each question carries equal marks.*

- Q.1 a) What is multi-valued dependency? Explain using a suitable example. What are its axioms? 5
- b) Consider the following database:  
 STUDENT (Std#, Std\_Name)  
 REGISTRATION (Std#, Course#)  
 Grade (Std#, Course#, Grade-obtained)  
 COURSE (Course#, Course\_Name, Instructor)  
 What do you mean by query optimization? Write an optimized relational algebra expression to find the names of courses higher than 'C-100' and all students registered in them. 10
- Q.2 a) Discuss timestamp ordering protocol for concurrency control. How does it guarantee consistency of the database? 10
- b) Draw a state diagram and discuss the typical states that a transaction goes through during execution. 5
- Q.3 Consider the following database:  
 PROJECT (Project#, Project\_NameChief-Architect)  
 EMPLOYEE (Emp#, Emp\_Name)  
 ASSIGNED TO (Project#, Emp#)  
 Express the following queries in SQL:
- a) Get details of the projects for each employee by name. 4
- b) Get all project names to which employee 107 is not assigned. 5
- c) Get the list of all employees who are assigned to all projects on which employee 109 is the Chief Architect. 6
- Q.4 a) What are the advantages of horizontal fragmentation? How is query evaluation complicated or simplified by horizontal fragmentation? Design an algorithm to perform the join of two relations, R and S, both of which are horizontally fragmented? 9
- b) Explain how fragmentation transparency, replication transparency and location transparency differ from each other. 6
- Q.5 a) Describe the wait-die and wound-wait protocols for deadlock prevention. 6
- b) What are UNDO-type and REDO-type log entries? 6
- c) Write SQL expression to delete a column 'Branch' from an existing table. 3
- Q.6 a) How query processing can be optimized in distributed databases? 5
- b) What do you understand by parallelism in distributed query processing? 5
- c) Discuss the various type constructors. How are they used to create complex object structures? 5
- Q.7 a) Describe oracle server and its structure. 5
- b) How table spaces and data-files are managed? 5
- c) What is the difference between persistent and transient objects? 5
- Q.8 a) Describe various techniques used for database performance tuning issues. 7
- b) Explain the configuration of oracle database. 4

c) How do you resize SGA structure?

4

**End Semester Examination, May 2017**  
**M. Tech.—Second Semester**  
**MOBILE AND WIRELESS COMMUNICATION (CS-M-221)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 1

Note: *Attempt ANY FIVE questions in all. Each question carries equal marks.*

- Q.1 a) Differentiate between "Wireless" and "Mobile" communication devices and categorize them to exhibit their relevant characteristics. 5  
 b) Which applications can benefit from wireless networks and mobile communications? 5  
 c) Define the following (*ANY TWO*):  
     i) Multiplexing.  
     ii) Multipath propagation.  
     iii) Modulation. 2½ × 2
- Q.2 a) What are the main benefits of a spread spectrum system? How can spreading be achieved? Explain DSSS giving an example. 10  
 b) Compare TDMA, FDMA and CDMA. 5
- Q.3 a) What do you understand by hidden and exposed terminal problem? What happens in case of such terminals if Aloha Slotted Aloha, Reservation aloha or MACA are used? 9  
 b) Explain code division multiple access (CDMA) method theoretically giving an example. 6
- Q.4 a) What are the performance characteristics of GSM? Explain architecture of the GSM system in detail. 10  
 b) What are the different types of handover in GSM? Explain. 5
- Q.5 a) Name the basic applications for satellite communication and describe the trends in brief. 5  
 b) How do inclination and elevation determine the use of a satellite? Explain with the help of a suitable diagram. 10
- Q.6 a) What characteristics do the different orbits have? What are their pros and cons? 9  
 b) 2G and 3G systems can both transfer data. Compare these approaches with DAB/DVA. 6
- Q.7 a) Explain the design goals and characteristics of wireless LAN. 5  
 b) Explain the system architecture of an infrastructure and adhoc based IEEE 802.11. 5  
 c) What do you understand by reverse tunneling? Explain with the help of a suitable diagram. 5
- Q.8 a) What are the different approaches for a mobile TCP? Explain any two in detail. 10  
 b) Why is strong consistency of file system problematic in a wireless and mobile environment? What are the alternatives? 5

**End Semester Examination, May 2017**  
**M. Tech. - Second Semester**  
**SOFTWARE ENGINEERING AND TESTING(CS-M-301)**

Time: 3 hrs

Max Marks: 75

No. of pages: 2

Note: *Attempt any FIVE questions in all. Each question carries equal marks.*

- Q.1 a) Explain the spiral model in detail and compare the spiral model with prototyping model. 10  
 b) How coupling is different from cohesion? Explain why should software have low coupling and high cohesion. 5
- Q.2 a) What are the five levels of Capability Maturity Model? Is it possible for an organization to achieve a higher level of CMM without achieving the lower one? Give explanation to support your answer. 10  
 b) Define software quality metric. Discuss various software quality metrics in detail. 5
- Q.3 a) Explain the software testing life cycle in detail. 10  
 b) 'Invalid inputs and unexpected behavior have a high probability of finding an error'. Prove it with the help of an example. 5
- Q.4 a) A program determines the next date in the calendar. Its input is entered in the form of (dd mm yyyy) with the following range:  
 $1 \leq mm \leq 12$   
 $1 \leq dd \leq 31$   
 $1900 \leq yyyy \leq 2025$   
 Its output would be the next date or it will display 'invalid date'. Design test cases for this program using robust testing method. 9  
 b) Explain equivalence class partitioning testing in detail with examples. 6
- Q.5 Consider the following program that reads in a string and then checks the type of each character.  
 main ( )  
     Clear string [80];  
     int index;  
     Print ("Enter the string for checking its characters");  
     &Cauf ("%s", string);  
     for (index = 0, string [index]! = '\0'; ++ index)  
     If ((string [index]> = '0') && (string [index]< = '9'))  
         Print ("-1 C is a digit", string [index]);  
     else if (((string [index]> = 'A' && ( string [index]<'Z'))  
         11((string [index]> = 'a') && (string [index]<'Z'))))  
         Printf ("%C is an alphabet", string [index]);  
     else  
         Print f ("%C is a special character", string [index]);  
     }  
     }
- a) Draw the DD graph for the program. 5  
 b) Calculate the cyclomatic complexity of the program using all methods and list all independent paths. 5

- c) Design test cases from independent paths. 5
- Q.6 a) Explain unit testing. What is the role of stubs and drivers in unit testing? Explain with examples. 8
- b) What is static testing? What are the advantages of static testing as compared to dynamic testing? 7
- Q.7 a) Explain various levels of object – oriented testing. 7
- b) What are the various issues in testing a class? Discuss. 4
- c) What is the major reason for adopting object oriented testing instead of structured approach? Discuss. 4
- Q.8 Write short notes on the following:
- a) Mutation Testing. 5
- b) 6-Sigma. 5
- c) States of a Bug. 5

## End Semester Examination, May 2017

B. Tech.–First/ Second Semester

### ELEMENTS OF ELECTRONICS ENGINEERING(EC-101A)

Time: 3 hrs

Max Marks:100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

- Q.1
- a) Which device produces voltage variable capacitance? How the capacitance vary with the change in voltage across it?
  - b) Differentiate between 'zener' and 'avalanche' breakdowns.
  - c) Differentiate between 'unipolar' and 'bipolar' transistors.
  - d) What are the universal logic gates? Why they are called so?
  - e) Differentiate between 'combinational' and 'sequential circuits'.
  - f) Explain the concept of virtual ground.
  - g) What is the major advantage of R-2R ladder type digital to analog converter as compared to a binary weighted type digital to analog converter?
  - h) How many memory location can be addressed by a microprocessor with 20 address line?
  - i) What is emitter follower? Why is it called so?
  - j) Differentiate between 'latch' and 'flip-flop'.
- 2x10

#### PART-A

- Q.2
- a) Explain the working principle of
    - i) Schottky diode
    - ii) Photodiode
 with their applications. 5x2
  - b) Explain diffusion and space charge capacitances in P-N junction diode 5
  - c) Explain working of centre tapfull wave rectifier. 5
- Q.3
- a) Draw and explain the input and output characteristics of a transistor in common base configuration. 10
  - b) Draw and explain working of n – channel JFET. 10
- Q.4
- a) Convert following:
    - (i)  $(ABCDEF, FEDCBA)_{16} = (?)_2$
    - (ii)  $(567.765)_8 = (?)_2$
    - (iii)  $(999)_{10} = (?)_2$
    - (iv)  $(ABCDE F)_{16} = (?)_8$
    - (v)  $(101.11)_2 = (?)_{10}$2x5
  - b) Draw and explain with truth table; working of S-R flip-flop. 10

#### PART-B

- Q.5
- a) Draw the circuit of an OP-AMP as differentiator and derive the output expression. 8
  - b) Draw the circuit diagram of an OP-AMP used as inverting amplifier with negative feedback and derive the expression for its voltage gain. 7
  - c) Explain how an OP-AMP can be used as a voltage follower? What are its applications? 5
- Q.6
- a) Explain parallel comparator type analog to digital convertor with its circuit diagram and working. 10



- b) Draw and explain working of four bit R-2R ladder type digital to analog convertor.10
- Q.7 a) Draw and explain internal architecture of 8085 microprocessor. 10
- b) Differentiate between 'microprocessor' and 'microcontroller'. 10

# End Semester Examination, May 2017

## B. Tech.–Second Semester ANALOG ELECTRONICS (EC-201)

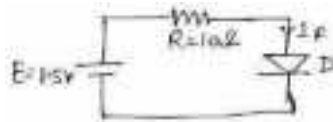
Time: 3 hrs.

Max Marks:100

No. of pages:1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1 a) How conductivity of semiconductor material increases?  
 b) \_\_\_\_\_ diode has negative resistance because initially it increases then \_\_\_\_\_.  
 c) Calculate forward current, ( $I_F$ ) for silicon diode with dynamic resistance  $r_d = 25\Omega$  used in the given circuit.



- d) Derive relation between  $\alpha$  and  $\beta$ .  
 e) Tabulate differences between BJT and FET.  
 f) Define 'pinch off voltage of JFET'.  
 g) What is the need of Biasing?  
 h) Define 'field effect transistor as VVR'.  
 i) Why transistor is called bipolar?  
 j) Write features of IC voltage regulator. 2 × 10

### PART-A

- Q.2 a) Explain V-I characteristics of P-N junction diode. Also derive diode current equation. 14  
 b) What is Schottky diode? How it is different from P-N junction diode, explain it? 6
- Q.3 a) A sinusoidal voltage of 40V and frequency 50 Hz is applied to a half wave rectifier.  $R_L = 100\Omega$ ,  $V_y = 0$ ,  $R_F = 20\Omega$ ,  $R_i = \infty$ . Find  $V_{dc}$ ,  $I_{dc}$ ,  $I_{max}$ ,  $I_{rms}$ , efficiency ( $\eta$ ), ripple factor and percentage regulation for it. 8  
 b) Explain voltage multiplier in brief with the help of a circuit diagram. 6  
 c) What is a filter? Explain  $\pi$ -filter with a suitable circuit diagram. 6
- Q.4 a) Explain common emitter characteristics of p-n-p transistor with a circuit diagram. 10  
 b) Explain transistor as an amplifier with a circuit diagram. 10

### PART-B

- Q.5 a) Calculate the minimum value of  $V_{DS}$  required for NMOSFET to operate in pinch-off condition when  $V_{GS} = 1V$ ,  $V_P = -2V$ ,  $I_{DSS} = 10 \text{ mA}$ . Also find the corresponding drain current. 10  
 b) Explain working of P-channel DeMOS-FET and also draw its V-I characteristics. 10
- Q.6 a) Define 'operating point'. Explain emitter biasing with the help of a suitable circuit diagram. Also derive an expression for stability factor for this technique. 12  
 b) Write short notes on:  
 i) Thermistor.  
 ii) Sensistor compensation. 4 × 2

- Q.7**    a) Tabulate differences between series and shunt voltage regulator. Also draw circuit diagram for both type of voltage regulator. **12**
- b) How to design a +5 volt fixed power supply by IC voltage regulator? Write its steps. **8**

**End Semester Examination, May 2017**  
**B. Tech.–Second Semester**  
**DIGITAL ELECTRONICS AND CIRCUITS (EC-202)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1
- State and prove De-Morgan's theorem.
  - What is gray code? Why we use it for solving Karnaugh map?
  - Draw EXOR gate using only '4' NAND gates.
  - What is the difference between 'combinational' and 'sequential circuit'?
  - Differentiate between Synchronous and Asynchronous counters.
  - What is the difference between fixed logic devices and programmable logic devices? Differentiate between ROM, PAL and PLA.
  - How many flip-flops are required to design MOD-10 counter?
  - Four bit DAC has maximum full scale output as 15V. Find out its resolution and percentage resolution?
  - What do you mean by excitation table? Draw excitation table of JK flip-flop.
  - What is the difference between bipolar and unipolar logic families? Explain with example.
- 2 × 10

**PART-A**

- Q.2
- Do the following subtraction using 2's complement in 8-bit notation:
    - $(35)_{10} - (12)_{10}$
    - $-(7)_{10} - (5)_{10}$

3 × 2
  - The seven bit hamming code is received as 0010001. Assume that even parity has been used; check whether it is correct or not. If not, find the correct hamming code. 8
  - Prove that
    - $\overline{AB} + \overline{A} + B = \overline{AB}$
    - $\overline{AD} + ABD = \overline{AD} + BD$
    - $(A+B)(A+C) = A+BC$

6
- Q.3
- Minimize the given logic function using QM method:  
 $F(A, B, C, D) = \sum m(1, 3, 7, 11, 15) + d(0, 2, 5)$ 

12
  - Design and realize the circuit of BCD to excess-3 code converter. 8
- Q.4
- Do the following flip-flop conversions:
    - SR to JK
    - T to JK
    - D to T

8
  - What is the difference between toggling and race around condition? Draw and explain the working of master slave JK flip-flop. 12

**PART-B**

- Q.5
- Design synchronous MOD-3 counters using
    - JK flip-flop
    - SR flip-flop
    - D flip-flop
    - T flip-flop

3 × 4
  - What is shift register counter? Draw and explain the working of four bit Johnson counter and highlight how it is different from ring counter? 8

- Q.6 a) Draw and explain the working of flash type A/D converter. List the advantages of flash type A/D converter over other A/D converters. 10
- b) Draw and explain the working of 4-bit weighted resistor type D/A converter. List the limitation of weighted type D/A converter. 10
- Q.7 a) Draw and explain TTL configuration:
- i) Totem pole output.
  - ii) Tristate output.
  - iii) Open collector output. 10
- b) Explain the following characteristics of digital ICs.
- i) Propagation delay time.
  - ii) Noise margin.
  - iii) Operating temperature.
  - iv) Power dissipation. 10

**End Semester Examination, May 2017**  
**B. Tech.–Third Semester**  
**ELECTRONIC DEVICES AND CIRCUITS (EC-301)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- Define 'dynamic resistance of PN junction diode'.
  - Define 'varactor diode' in brief.
  - Draw h-parameter model of a transistor.
  - Define 'gain in transistor amplifier'.
  - Explain the term: 'transistor'.
  - What is the need of multistage amplifier?
  - What is phase distortion in transistor amplifier?
  - What is the role of 'mixer and sampler role in feedback amplifier'?
  - Define 'sensitivity of amplifier'.
  - Draw the equivalent circuit of a crystal oscillator.
- 2x10

**PART-A**

- Q.2
- Explain V – I characteristics of PN junction diode. 6
  - What is diffusion? Explain diffusion capacitance in PN junction diode. 4
  - Draw and explain volt-ampere characteristics of a tunnel diode. 10
- Q.3
- Explain various biasing techniques for transistor with the help of a suitable circuit diagram and derivation. 14
  - Explain difference between depletion mode and enhancement mode MOSFET. 6
- Q.4
- Derive expression for lower cutoff frequency and upper cutoff frequency of two stage RC coupled amplifier. 20

**PART-B**

- Q.5
- Explain transformer coupled class A power amplifier with the help of suitable circuit diagram. Derive expression for its collector efficiency. Also explain why push – pull configuration of any power amplifier is better than normal power amplifier. Explain class A push – pull amplifier. 20
- Q.6
- Draw a block diagram of a negative feedback amplifier. Also derive an expression for stabilization of gain. 10
  - Derive an expression for closed loop gain, input impedance and output impedance for voltage amplifier. 10
- Q.7
- Explain Hartley oscillator with the help of a circuit diagram. Also derive expression for resonance frequency. 10
  - What is phase-lead or phase-lag in RC shift oscillator? Derive an expression for resonance frequency of phase shift oscillator. 10

**End Semester Examination, May 2017**  
**B. Tech.–Third/ Fourth Semester**  
**DIGITAL ELECTRONICS(EC-302A)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1
- Give digital signal representation of negative logic.
  - What is  $A(\bar{A} + B)$  equal to?
  - Find the two's complement of 11011000.
  - Represent decimal number 396 in gray code.
  - Define fan-out of a digital IC.
  - List some applications of counters.
  - State the difference between decade counter and down counter.
  - List certain specifications of D/A converter.
  - Define 'pull up resistor'.
  - How many bits does a nibble contain?
- 2x10

**PART-A**

- Q.2
- Construct hamming code for BCD no. 1011. Use even parity. 5
  - Find the distance between digits 0110 and 1001. 3
  - Minimize the four variable logic function:

$$f(A, B, C, D) = (A + B + \bar{C} + \bar{D}) \cdot (\bar{A} + C + \bar{D}) \cdot (\bar{A} + B + \bar{C} + \bar{D}) \cdot (\bar{B} + C) \cdot (\bar{B} + \bar{C}) \cdot (A + \bar{B}) \cdot (\bar{B} + \bar{D})$$

12

- Q.3
- Implement the expression using a multiplexer:  

$$f(A, B, C, D) = \sum m(0, 1, 4, 5, 7, 10, 11, 13)$$
 8
  - Implement the following multi output combinational logic circuit using 4 to 16 line decoder:

$$F_1 = \sum m(1, 3, 4, 7, 9, 10, 11, 13)$$

$$F_2 = \sum m(3, 5, 9, 11)$$

$$F_3 = \sum m(11, 13, 14)$$

$$F_4 = \sum m(3, 6, 9)$$

12

- Q.4 Write short notes on any three of the following:
- Programmable array logic.
  - Transistor transistor logic.
  - Characteristics of digital IC's.
  - Applications of PLA and PAL.
- 20

**PART-B**

- Q.5
- Explain a clocked SR flip flop. 8
  - Draw the complete excitation table of all flip flops. (SR, JK, T and D) 12
- Q.6
- Explain in detail a 5 bit shift register. 10
  - Explain the working of a twisted ring counter with the help of a diagram. 10
- Q.7
- Explain in detail the working of the R – 2R ladder D/A converter. 14

b) Determine the resolution of a 12 bit DAC.

6



# End Semester Examination, May 2017

B. Tech.–Third Semester

## SIGNALS AND SYSTEMS(EC-303A)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1
- Differentiate between causal and anticausal signal.
  - Given  $x_1(n) = [1, 2, 0, -1, 2, 3, 4]$ . Calculate  $x_1(n-3)$
  - State superposition principle.
  - What is ROC?
  - Define stable and unstable system.
  - Write down exponential form of fourier series representation of a periodic signal.
  - Explain convolution property of fourier transform.
  - Determine DTFT of  $x(n) = \left(\frac{1}{4}\right)^n \mu(n)$
  - Determine Laplace transform of  $x(t) = t^3 + 3t^2 - 6t + 4$ .
  - State and prove time shifting property of DTFT.

2x10

### PART-A

- Q.2 a) Determine whether the signal is energy signal or power signal:

$$x(n) = (-0.5)^n \mu(n)$$

8

- b) A discrete time signal is given as:

$$x(n) = [1, -1, 0, 2, -1, 4]$$

Determine  $x\left(\frac{n}{2}\right) + 4x(n-1) + 2x(-n)$

8

- c) State relation between unit impulse, unit step and ramp signal.

4

- Q.3 a) Check whether the following systems are BIBO stable or not.

(i)  $y(n) = e^{-x(n)}$

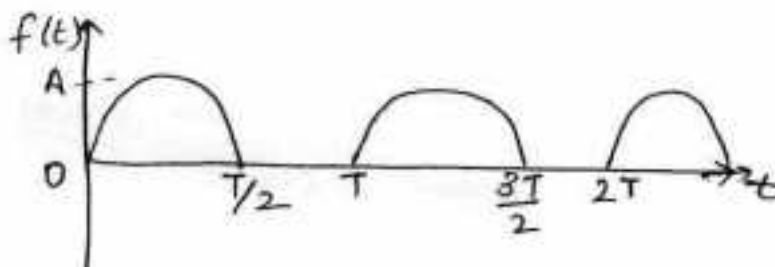
(ii)  $y(n) = \max [x(n), x(n-1), x(n-2)]$

10

- b) A system having impulse response  $h(n) = [2, 1, -1, 2]$  is initiated with an input  $x(n) = [1, 2, -1, 3]$ . Calculate its output  $y(n)$ .

10

- Q.4 a) Determine the laplace transform of periodic, rectified half wave sine wave given as:



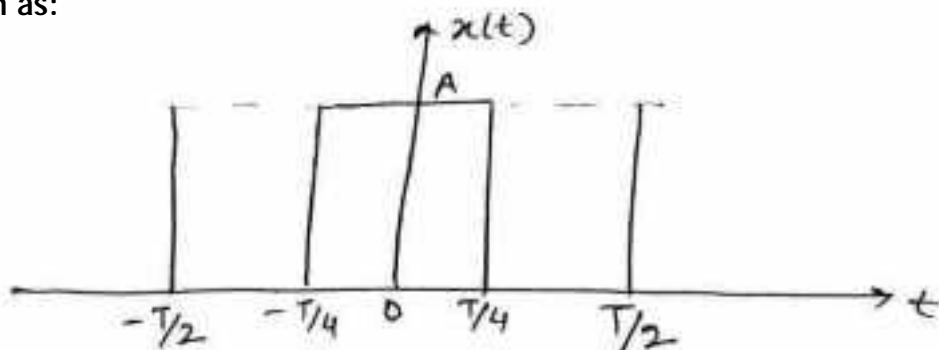
10

- b) Determine the steady state response of the following systems to unit step excitation

$$H(S) = \frac{S+2}{S^2+3S+2} \quad 10$$

**PART-B**

- Q.5 a) Obtain exponential fourier series representation of periodic rectangular wave form given as:



- b) State and prove parseval's identity for fourier series.

- Q.6 a) Obtain fourier transform of the function:

$$x(t) = 5[u(t+3)] + u(t+2) - u(t-2) - u(t-3) \quad 10$$

- b) A certain function of time  $f(t)$  has following Fourier transform:

$$F(j\omega) = \frac{1}{\omega^2 + 1} e^{-2\omega^2/(\omega^2 + 1)}$$

Using properties of the fouriertransform, write fourier transforms of:

- (i)  $f(2t)$  (ii)  $f(t-2)e^{jt}$  (iii)  $4\frac{d}{dt}f(t)$  (iv)  $f\left(\frac{-t}{2}\right) \quad 10$

- Q.7 a) A discrete time signal is given as  $x(n) = a^{|n|}$  for  $-1 < a < 1$ . Find its DTFT. Also calculate amplitude and phase spectrum. 10

- b) Find the convolution of the signal  $x_1(n)$  and  $x_2(n)$  using discrete time

fourierTransform where  $x_1(n) = \left(\frac{1}{2}\right)^n \mu(n)$  and  $x_2(n) = \left(\frac{1}{3}\right)^n \mu(n)$

10

**End Semester Examination, May 2017**  
**B. Tech.–Third / Fourth Semester**  
**ELECTROMAGNETIC FIELD AND WAVES (EC-304A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 a) Vectors are given as:

$$A = 5\hat{a}_x + 4\hat{a}_y + 3\hat{a}_z \text{ and,}$$

$$B = 2\hat{a}_x + 3\hat{a}_y + 4\hat{a}_z$$

Find the angle between  $A$  and  $B$ .

b) Convert the following point specified in Cartesian coordinate into cylindrical coordinate:

$$(-\sqrt{2}, \sqrt{2}, 3)$$

c) Explain the physical significance of divergence.

d) Define the electric field at a point in space.

e) Write a short note on energy stored in a magnetic field.

f) Write Maxwell's equations in their general differential form.

g) Find the velocity of a plane wave in a lossless medium having a relative permittivity of 4 and relative permeability of unity.

h) Define the term 'skin depth' and give its physical significance.

i) If magnetic field intensity in a region is:

$$H = x^2 a_x + 27 a_y - x^2 a_z$$

Find the current density at point (2, 3, 4).

j) Why impedance matching is needed in transmission line?

2 × 10

**PART-A**

Q.2 a) Given point  $P(-2, 6, 3)$  and vector

$$A = y\hat{a}_x + (x + z)\hat{a}_y$$

Express  $P$  &  $A$  in cylindrical and spherical coordinates. Evaluate  $A$  at  $P$  in Cartesian, cylindrical and spherical coordinate system. 10

b) Explain stroke's theorem. 5

c) Find the Laplacian of the scalar field

$$v = e^{-z} \sin 2x \cos hy$$

5

Q.3 a) State and prove the boundary conditions that must be satisfied by the electrostatic field intensity vector and the electric flux density vector at the interface between the two perfect dielectrics. 10

b) Determine the energy stored in the system of two point charges,  $Q_1 = 3 \times 10^{-9} C$  and  $Q_2 = -3 \times 10^{-9} C$  separated by a distance of  $r = 0.2 m$ . 5

c) Define the potential at a point in an electric field and state the relationship between potential and field intensity. 5

Q.4 a) Derive an expression for the magnetic field about a long straight wire carrying a current- $I$ . 8

- b) What is magnetic vector potential? 7
- c) In a current free region of relative permeability 1, the magnetic scalar potential is given as:  

$$v_m = x^2y + y^2x + z$$
 Calculate the magnitude of the magnetic flux density at (1, 1, 1). 5

### **PART-B**

- Q.5 a) Explain the inconsistency of Ampere's law. 7
- b) Explain the terms "linear polarization", "elliptical polarization", "circular polarization". 8
- c) A plane travelling wave in free space has an average poynting vector of 1 W/m<sup>2</sup>. Find the average energy density. 5
- Q.6 a) Discuss the electromagnetic wave propagation in loss dielectric in detail. 10
- b) Show that the power per unit area of a uniform plane wave is  $P = EXH$ . 10
- Q.7 a) A distortionless line has a characteristic impedance  $z_0 = 60\text{ ohm}$ , attenuation constant  $(\alpha) = 20\text{ mNP/m}$ , wave velocity  $(u) = 0.6C$ , where  $C$  is the speed of light in vacuum. Find  $R, L, G, C$  and  $\lambda$  at 100 MHz frequency. 10
- b) Define the terms and obtain expressions for the voltage standing wave ratio, reflection percentage on a loss free line having mismatch. 10

**End Semester Examination, May 2017**  
**B. Tech.–Third Semester**  
**ANALOG ELECTRONIC CIRCUITS - I (EC-321)**

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

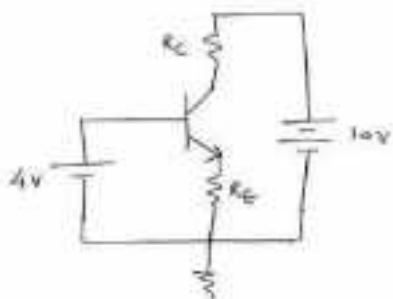
- Q.1
- Define early effect or base width modulation in transistor.
  - Why emitter follower is called so?
  - What are the limitations of h-parameters?
  - What is the relation between  $f_\beta$  and  $f_T$ ?
  - Define gain bandwidth product.
  - State miller theorem and draw the circuit diagram for the same.
  - Why Darlington connection cannot be used for more no. of states?
  - What is tilt and sag?
  - If the current gain of transistor in common emitter is 50, what can you state about its  $h_{fe}$ .
  - Derive the relation between  $\alpha$  and  $\beta$ . 2x10

**PART-A**

- Q.2
- Draw the h-parameter equivalent circuit of a parameter in common base configuration. Calculate various parameters related to the same. 15
  - Write the Eber's Moll equation and sketch the circuit model which satisfies these equations. 5
- Q.3
- Calculate the voltage gain for high frequency response of emitter follower configuration of transistor. 10
  - Draw the hybrid T model of BJT in common emitter configuration and calculate the current gain for the same. 10
- Q.4
- Explain potential divider biasing for field effect transistor with the help of circuit diagram. 10
  - Explain how FET can be used as voltage variable resistance? 10

**PART-B**

- Q.5
- Explain the following terms in brief related to transistor voltage amplifier:
    - Input impedance.
    - Output impedance.
    - Voltage gain.
    - Current gain.
    - Power gain10
  - Analyze the circuit shown in figure 2, to determine all the node voltages and branch currents. Assume that  $\beta = 100$ ;  $V_{BE} = 0.7$  V.



$$R_c = 4.7\text{ K}; R_E = 3.3\text{ K}$$

10

- Q.6 Derive the expression for low, mid and high frequency gain of RC coupled amplifier with common emitter configuration. 20
- Q.7 Write short notes on *(any two)*:
- a) Class AB push pull amplifier.
  - b) Class B push pull amplifier
  - c) Cross over distortion.
  - d) Class C power amplifier.
- 10x2

**End Semester Examination, May 2017**  
**B. Tech.–Fourth/ Fifth Semester**  
**MICROPROCESSOR AND INTERFACING (EC-401B)**

Time: 3 hrs.

Max Marks:100

No. of pages:2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1 a) What is the difference between?  
 LDA 2500<sub>H</sub> and {LXI<sub>H</sub>, 2050<sub>H</sub>; MoV A, M} instructions
- b) Differentiate between maskable and non maskable interrupts of 8085 microprocessor.
- c) Differentiate between microprocessor and microcontroller.
- d) What is memory banking? How it is done? What are its advantages?
- e) How many address lines are required to point eight megabyte memory?
- f) What is the difference between fixed priority and rotating priority modes of 8259?
- g) Differentiate between programmed I/o, Interrupt driven I/o and parallel I/o modes.
- h) What is control word format of 8255? Draw control word format for model-I.
- i) What is the role of PC and SP in 8085?
- j) How 8253/8254 can be operated as a square waveform generator? 2 × 10

**PART-A**

- Q.2 a) Explain the function of following signals of 8085 microprocessor:  
 i) HOLD  
 ii) S<sub>0</sub> and S<sub>1</sub>  
 iii) RESET  
 iv) RST 7.5 1½ × 4
- b) Explain addressing modes of 8085 microprocessor with an example. 6
- c) Draw and explain timing diagram of instruction MVI C, 32<sub>H</sub>. 8
- Q.3 a) Draw and explain architecture of 8086 microprocessor. 7
- b) Explain the function of following pins of 8086 microprocessor:  
 i)  $\overline{RQ}/\overline{GT_0}$  and  $\overline{RQ}/\overline{GT_1}$   
 ii)  $\overline{LOCK}$   
 iii)  $\overline{BHE}/S_7$   
 iv)  $\overline{TEST}$  2 × 4
- c) Draw and explain interrupt structure of 8086 microprocessor. 5
- Q.4 a) Write a program in 8086 for hexadecimal to gray code conversion using look up table. 8
- b) Explain the following instructions of 8086 microprocessor with examples:  
 i) SAR  
 ii) RCR  
 iii) LODSW  
 iv) STD

v) LOOP

vi) SAHF

2×6

**PART-B**

- Q.5 a) Interface  
       i) 8 DTP switches  
       ii) 8 LEDs with 8085 microprocessor. 12  
       b) Differentiate between memory mapped I/o and I/o mapped I/o. 8
- Q.6 a) Configure 8255 in following I/o mode:  
       Port A; Input  
       Port B; Output  
       Port C<sub>Upper</sub>; Output  
       Port C<sub>Lower</sub>; Input  
       Use mode 0 for both group A and group B. 4  
       b) Write a BSR control word subroutine to set bits PC<sub>2</sub>, PC<sub>4</sub> and PC<sub>6</sub> and reset them after 10 ms. 4  
       c) Draw and explain control word and status word of mode 2 of operation of 8255. 12
- Q.7 a) Draw and explain architecture of 8237 with register organization. 10  
       b) Explain ICW's and OCW's of 8259. 10



**End Semester Examination, May 2017**  
**B. Tech.—Fourth Semester**  
**ANALOG ELECTRONIC CIRCUITS (EC-403)**

Time: 3 hrs.

Max Marks: **100**

No. of pages: **1**

Note: Attempt **FIVE** questions in all; **Q.1** is compulsory. Attempt **ANYTWO** questions from **PART-A** and **TWO** questions from **PART-B**. Each question carries equal marks.

- Q.1
- Name possible methods to improve CMRR.
  - What is full power bandwidth of op-amp?
  - Draw circuit diagram of current to voltage converter.
  - Why precision rectifier is known as super diode?
  - Why complementary-symmetry push-pull amplifier is used in output stage of operational amplifier?
  - What is virtual ground concept?
  - Draw circuit diagram of Deboo integrator.
  - What is the need of IC regulator?
  - Why triangular waveform generator does not work efficiently at low frequency.
  - Define 'Hysteresis'. Why this is developed in Schmitt trigger? **2×10**

**PART-A**

- Q.2
- Derive expression for A.C. analysis of dual input balanced output differential amplifier. **10**
  - Draw block diagram of operational amplifier and explain working of its each block. Also write its ideal characteristics. **10**
- Q.3
- The input to the differentiator circuit is a sinusoidal voltage of peak value 4mV and frequency 1 KHz. Find the output voltage if  $R = 50\text{ K}\Omega$ . and  $C = 1\text{ }\mu\text{F}$ . **10**
  - Derive expression for feedback gain of non-inverting configuration of operational amplifier. (for exact value of closed loop gain) **10**
- Q.4
- Derive expression for output voltage of logarithmic amplifier with the help of circuit diagram. **10**
  - Derive expression for output voltage for OTA with help of neat diagram. **10**

**PART-B**

- Q.5
- Derive expression for transfer function of Sallen Key low pass filter. **10**
  - What is twin-T oscillation? Derive expression for its resonance frequency. **10**
- Q.6
- What is multi vibrator? Explain mono stable multi vibrator with the help of circuit diagram. **20**
- Q.7
- What is the difference between series and shunt voltage regulator? Explain with the help of diagram. **10**
  - What is SMPS? Explain it with the help of circuit diagram. **10**

**End Semester Examination, May 2017**  
**B. Tech. – Third / Fourth Semester**  
**COMMUNICATION ENGINEERING-I (EC-404)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- Define 'signal'. What are different types of signals?
  - Find the Fourier transform of the signal given below:  

$$s(t) = e^{-at} u(t)$$
  - State and prove time shifting property of Fourier Transform.
  - A single tone modulation signal  $m(t) = A_m \cos \omega_m t$  amplitude modulates a carrier  $c(t) = A_c \cos \omega_c t$ . Derive an expression for AM wave.
  - Explain how VSB modulation is used for TV transmission.
  - Show how PM is generated from FM?
  - An angle modulated signal with carrier frequency,  $\omega_c = 2\pi \times 10^5$  is described by the equation:  

$$s(t) = 10 \cos(W_c t + 5 \sin 3000t)$$
    - Find the power of the modulated signal.
    - Find the frequency deviation.
  - Compare low level and high level transmitters.
    - Determine the relation between 'noise figure' and 'noise temperature'.
  - Define and explain following receiver characteristics:
    - Selectivity.
    - Sensitivity.

2x10

**PART-A**

- Q.2
- Define 'communication'. Draw the block diagram of a communication system and explain each block in detail. 10
  - What is modulation? Why is it needed? 10
- Q.3
- Find the Fourier series expansion of full wave rectified wave. 10
  - Find the Fourier Transform of a Gaussian pulse given by:  

$$f(t) = \exp(-t^2/2\sigma^2)$$
 10
- Q.4
- Explain the generation of SSB-SC signal using frequency discriminator method. 7
  - Discuss the effect of phase and frequency errors in synchronous detection. 6
  - Discuss the choice of time constant RC for a linear diode detector of AM signal. 7

**PART-B**

- Q.5
- Distinguish between NBFM and WBFM signals. 6
  - Explain the parameter variation method of FM generation. 7
  - Explain ratio detector method of detection of FM signals. Give its merits and demerits. 7
- Q.6
- How super heterodyne receiver is an improvement over TRF receiver? Draw the block diagram of super heterodyne receiver and explain its working 10
  - What is the function of FM receiver? Draw the block diagram and describe all the stages of the FM receiver. 10

- Q.7 a) A cascade in a receiving system comprises of three stages with noise figures  $F_1$ ,  $F_2$ ,  $F_3$  and gains as  $G_1$ ,  $G_2$ ,  $G_3$ . Derive the expression for overall noise figure. 10
- b) What is noise? Explain different types of noise in detail. 10

**End Semester Examination, May 2017**  
**B. Tech.—Fourth Semester**  
**ELECTROMAGNETIC THEORY (EC-421)**

Time: 3 hrs.

Max Marks: **100**

No. of pages: **2**

Note: Attempt **FIVE** questions in all; **Q.1** is compulsory. Attempt **ANYTWO** questions from **PART-A** and **TWO** questions from **PART-B**. Each question carries equal marks.

- Q.1 a) Given vector  $A = a_x + 3a_z$  and  $B = 5a_x + 2a_y - 6a_z$ , determine a unit vector parallel to  $3A + B$ .  
 b) What is scalar product? Explain with an example.  
 c) State Gauss's law.  
 d) Obtain a relationship between E and V.  
 e) Define magnetic field intensity and magnetic flux density with units.  
 f) Differentiate between conduction current and displacement current.  
 g) Explain the law of conservation of magnetic flux.  
 h) Write Maxwell's equation in differential and integral form for static field.  
 i) Write the application of Smith Chart.  
 j) Define depth of penetration and on which factor it depends. **2×10**

**PART-A**

- Q.2 a) Calculate the following;  
 i) Grad of  $V = 10 \rho \cos \phi - \rho z$ .  
 ii) Curl of  $V = r a_r + r \cos^2 \theta a_\phi$ . **2½×2**  
 b) State and prove Divergence theorem. **8**  
 c) Transform the vector  $r a_\phi + r a_z$  and  $r a_\theta + r a_\phi$  into Cartesian coordinates. **7**
- Q.3 a) Derive an expression for electric field intensity  $E$  due to uniformly distributed charge over an infinite plane with surface charge ' $\rho_s$ '.  
 b) Discuss the boundary condition for dielectric-dielectric interface. **10×2**
- Q.4 a) What is magnetic vector potential? Derive an expression for the same.  
 b) Explain the term 'energy density and energy stored in a magnetic field'. **10×2**

**PART-B**

- Q.5 a) State and prove the Maxwell's equations for time varying field and harmonically time varying field.  
 b) Show that the instantaneous Poynting vector of a circularly polarized wave propagating in a lossless medium is a constant that is independent of time and distance. **10×2**
- Q.6 a) The magnetic field component of a wave is given by  $H = 30 \cos(10^8 t - 6x) a_y$  mA/m. Determine the:  
 i) Direction of propagation.  
 ii) Wavelength.  
 iii) Frequency.  
 iv) Propagation constant. **2½×4**
- b) With the help of a suitable diagram and mathematical expression, define:  
 i) Linear polarization.  
 ii) Circular polarization.  
 iii) Elliptical polarization. **10**

- Q.7 a) For a transmission line the following are its parameters for unit length:  $R = 10.4\pi$ ,  $L = 3.66mH$ ,  $G = 0.08$  and  $C = 0.00835\mu f$ . Calculate  $Z_0$ ,  $\alpha$ ,  $\beta$  and phase velocity at  $\omega = 500 \text{ rad/sec}$ . **10**
- b) Derive an expression for relationship between VSWR and reflection coefficient. **5**
- c) Write a short note on impedance matching. **5**

**End Semester Examination, May 2017**  
**B. Tech.—Fourth Semester**  
**HARDWARE DIGITAL DESIGN (EC-422)**

Time: 3 hrs.

Max Marks: **100**

No. of pages: **1**

Note: Attempt **FIVE** questions in all; **Q.1** is compulsory. Attempt **ANYTWO** questions from **PART-A** and **TWO** questions from **PART-B**. Each question carries equal marks.

- Q.1
- a) What is a hardware description language? List various HDL languages.
  - b) Why computer aided design tools are used?
  - c) What is the difference between concurrent and sequential modeling?
  - d) Define 'component instantiation'. Why is it required?
  - e) What is delta delay? Why is it required?
  - f) Perform the following operation:
    - i)  $12 \bmod 5$ .
    - ii)  $(-12) \bmod (-5)$ .
  - g) What are scalar data types? Give examples of any two scalar types.
  - h) Differentiate between 'pure' and 'impure' functions with example.
  - i) What is a test bench? Why is it required?
  - j) Draw the state diagram of a 2-bit up down counter. **2×10**

**PART-A**

- Q.2
- a) Discuss various design phases of a digital IC. Also give examples of the CAD tools used at various design steps. **10**
  - b) Define various constructs required for writing a VHDL code with example. **5**
  - c) What are various styles of modeling in VHDL? Also, elaborate the importance of each of them. **5**
- Q.3
- a) What is a composite data type? Describe its types with suitable examples. **10**
  - b) Describe inertial and transport delay models. Also write their applications in digital systems. **10**
- Q.4
- a) Write VHDL code for BCD to excess. 3code converter in behavioral style of modeling. **10**
  - b) Write a program to calculate the factorial in VHDL. **5**
  - c) Why is generate statement used? Give example. **5**

**PART-B**

- Q.5
- a) Write VHDL code for asynchronous decade counter using structural modeling. **10**
  - b) Write VHDL code for JK flip-flop using case statement and D-flip-flop using if statement. **10**
- Q.6
- a) Design following logic using Moore machine and then write its VHDL code:
    - i) The system has four states: ST0, ST1, ST2 and ST3.
    - ii) System stays at its current state if the input 'A' remains at logic '0'.
    - iii) If input 'A' is at logic '1', the system changes its state from ST0 to ST1, ST1 to ST2, ST2 to ST3 and ST3 to ST1. Also, draw the state diagram. **5×3**
  - b) What is block statement? Give example. **5**
- Q.7
- a) Implement a simple microcomputer using VHDL. **10**
  - b) Explain the architecture of FPGA in detail. **10**

**End Semester Examination, May 2017**  
**B. Tech.–Fourth Semester**  
**ANALOG ELECTRONIC CIRCUIT-II (EC-423)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- What is the need of feedback amplifier? What are various types of feedback amplifier?
  - Derive an expression for positive feedback amplifier gain (closed loop).
  - A feedback amplifier has voltage gain of 400 without feedback. Determine the voltage gain with feedback if the feedback ratio is 0.2.
  - Draw a circuit diagram of crystal oscillator.
  - What is the slew rate of an op-amp whose output voltage change by 28 V in 4 $\mu$ s?
  - Why open loop op-amp are not used in linear application?
  - Differentiate between passive and active filter.
  - Draw a circuit diagram of difference amplifier.
  - Draw and explain floating load voltage to current converter.
  - Why higher order filter is preferred?
- 2 × 10

**PART-A**

- Q.2
- What is negative feedback? List all types of negative feedback configurations and derive an expression for voltage gain, input and output impedance for any two types of amplifiers. 10
  - Explain the effect of negative feedback on frequency response of an amplifier with the help of analysis. 6
  - Voltage gain of amplifier without feedback is 60dB. It decreases to 40dB with feedback. Calculate feedback factor. 4
- Q.3
- Explain the working of Colpitt's oscillator and calculate the frequency of oscillation. Show the condition to keep the loop gain greater than or equal to unity. 10
  - What are essentials of transistor oscillator? 5
  - In transistorized Hartley oscillator, the tank circuit has C = 100PF, inductance between collector and tapping point is 30 mH and inductance between tapping point and transistor base is  $1 \times 10^{-8}$ H. Determine the frequency of oscillator. Neglect mutual inductance. 5
- Q.4
- What is differential amplifier? Derive an expression for ac analysis of dual input balance output differential amplifier. 10
  - Calculate the operating point, voltage and current for dual input unbalanced output differential amplifier given:  
 $V_{CC} = +12V$ ,  $V_{EE} = -12V$ ,  $R_E = 10k\Omega$ ,  $R_C = 10k\Omega$ ,  
 $R_B = 20k\Omega$ ,  $\beta = 75$  and  $V_{BE} = 0.7V$  10

**PART-B**

- Q.5
- Draw and explain various block of an operational amplifier. Also explain its ideal characteristics. 10

- b) What is integrator? Derive an expression for its output voltage. Also explain its response. 10
- Q.6 a) Explain working of logarithmic amplifier by operational amplifier. Derive expression for its output voltage. 10
- b) Explain precision rectifier with suitable circuit diagram. 10
- Q.7 a) Write short notes on:
- i) Notch filter.
  - ii) Band pass filter.
  - iii) State variable filter.  $4 \times 3$
- b) How to design a 2<sup>nd</sup> order butter worth filter. Write its steps in general form. 8



**End Semester Examination, May 2017**  
**B. Tech.–Fifth Semester**  
**ANTENNA AND WAVE PROPAGATION (EC-501B)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1
- a) What is antenna? Why it is essential part of any communication system?
  - b) Define 'omnidirectional antenna'.
  - c) Define 'linear array'.
  - d) Differentiate between 'near field' and 'far field' of antenna.
  - e) Define 'noise temperature'.
  - f) Define 'flare angle of horn antenna'.
  - g) List factors affecting propagation of radio waves.
  - h) What is Duct Propagation?
  - i) Define 'frequency independent antenna'.
  - j) Explain polarization types in brief. 2x10

**PART-A**

- Q.2
- a) Derive an expression for wave equations in terms of EM potentials. 10
  - b) Derive expression for radiation resistance and power radiated from Hertzian dipole. 10
- Q.3
- a) Prove that intrinsic impedance of free space is  $377\Omega$ . 8
  - b) State and explain reciprocity theorem of antenna. Derive it mathematically. 12
- Q.4
- a) What is array? Explain various types of array. Explain two point array sources. 15
  - b) Write differences between Broadside array and Endfire array. 5

**PART-B**

- Q.5
- a) Explain Yagi-Uda antenna in detail. List its general characteristics and application. 10
  - b) What is folded dipole antenna? Describe the current distribution and radiation pattern of folded dipole. 10
- Q.6
- a) Explain following in brief:
    - i) Virtual height
    - ii) Critical frequency
    - iii) Maximum usable frequency12
  - b) Derive mathematical expression for skip distance. 8
- Q.7
- a) Explain procedure to measure directivity in detail. 10
  - b) Explain Gain transfer method to measure gain of antenna. 10



b) A LPF is to be designed with the following desired frequency response:

$$H_d(e^{j\omega}) = \begin{cases} e^{-j2\omega} & , \quad -\pi/4 \leq \omega \leq \pi/4 \\ 0 & , \quad \pi/4 < |\omega| \leq \pi \end{cases}$$

Determine the filter coefficients  $h_d(n)$  if the window function is defined as:

$$w(n) = \begin{cases} 1 & , \quad 0 \leq n \leq 4 \\ 0 & , \quad \text{otherwise} \end{cases}$$

Also determine the frequency response  $H(e^{j\omega})$  of the designed filter.

10

Q.7 a) Sketch the ladder structure for the system

$$H(z) = \frac{1 - 0.6z^{-1} + 1.2z^{-2}}{1 + 0.15z^{-1} - 0.64z^{-2}}$$

10

b) List advantages of parallel form realization of IIR filters.

5

c) Realise the following causal linear phase FIR system function.

$$H(z) = \frac{2}{3} + z^{-1} + \frac{2}{3} z^{-2}$$

5

**End Semester Examination, May 2017**  
**B. Tech.–Fifth Semester**  
**DIGITAL SYSTEM DESIGN (EC-503A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) Differentiate between 'VHDL' and 'Verilog'.
  - b) Explain different types of standard logic.
  - c) What do you mean by delta delay?
  - d) What are generics? Give examples.
  - e) Differentiate between 'constants and variables'.
  - f) What do you mean by hardware abstraction?
  - g) Differentiate between 'procedure' and 'function'.
  - h) What is difference between synchronous and asynchronous circuit design?
  - i) Write VHDL entity for half adder.
  - j) Perform the operation  $10011001 \text{ sla } +2$ . 2 × 10

**PART-A**

- Q.2
- a) What is operator overloading in VHDL? Explain. 10
  - b) Explain the need of an HDL. What are the advantages and limitations of VHDL? 10
- Q.3
- a) Explain the difference between concurrent and sequential signal assignment with example. 10
  - b) What are the types of object declaration used in VHDL? 10
- Q.4
- a) Design a 4:1 mux circuit using VHDL. 10
  - b) Describe the following terms with reference to VHDL. 10
    - i) Entity      ii) Architecture      iii) Package      iv) Library.

**PART-B**

- Q.5
- a) Design a ring counter using VHDL. Use J-K flip-flops in the design. 10
  - b) Design S-R flip-flop using VHDL. 10
- Q.6
- a) Design an ALU using VHDL for a 4-bit microprocessor that has four 4-bit registers and supports the following operations: 10
    - i) ADD      ii) SUB      iii) AND      iv) NOT
  - b) Explain various components of a micro-computer system. 10
- Q.7
- a) Differentiate between PAL and FPGA. 5
  - b) Compare PROM, PLA and PAL. 5
  - c) Implement full adder using PAL. 10

**End Semester Examination, May 2017**  
**B. Tech.—Sixth Semester**  
**WIRELESS COMMUNICATION (EC-506)**

Time: 3 hrs.

Max Marks: **100**

No. of pages: **1**

Note: Attempt **FIVE** questions in all; **Q.1** is **compulsory**. Attempt **ANYTWO** questions from **PART-A** and **TWO** questions from **PART-B**. Each question carries equal marks.

- Q.1
- What is the frequency band of a GSM system?
  - Define FDD and TDD.
  - Differentiate between reflection and scattering.
  - What is the frequency used in bluetooth?
  - Define 'coherence time' and 'doppler spread'.
  - A spectrum of 30 MHz is allotted to a cellular service provider, which can use two 25 KHz simplex channels to provide full duplex voice and control channels. Calculate the total number of channels available in the system.
  - Differentiate between 3G and 4G communication.
  - What is ISI?
  - What is the concept of frequency re-use?
  - Calculate the number of physical channels supported in a GSM system. **2×10**

**PART-A**

- Q.2
- Explain the evolution of mobile wireless communication system from 1G to 3G with the help of labeled block diagram. **10**
  - What are the various control channels in a GSM system? Explain them briefly. **10**
- Q.3 Write brief notes on:
- EDGE.
  - 4G system.
  - IEEE 802.11 WLAN Std.
  - Advanced mobile phone system.
  - W-CDMA. **4×5**
- Q.4
- Calculate the path loss and the power received in a free space propagation model. **10**
  - Find the fraunhofer distance for an antenna with maximum dimension of 1 mtr and operating frequency of 900 MHz. If antenna has unity gain, calculate path loss  $\left(d_f = 2D^2/\lambda\right)$ . **4**
  - Discuss the signal prediction in Okumura model. **6**

**PART-B**

- Q.5
- What is diversity? List various diversity techniques and explain any one briefly. **10**
  - What is equalization and what is its need? Explain the fundamental principle of equalization with the help of a block diagram. **10**
- Q.6
- Discuss the concept of frequency re-use. Prove that  $C=M.S$ , where 'M' is the number of time the cluster is replicated and 'S' is the number of duplex channels available for use. **10**
  - Briefly discuss the handoff strategies. **6**
  - If 600 channels are available in a cellular system, calculate the number of channels available per cell if the system uses 4 cell re-use. **4**
- Q.7 Write short notes on (**ANY TWO**):
- Packet radio and slotted ALOHA protocols.
  - Spread spectrum techniques.
  - FDMA, CDMA and TDMA.
  - HATA model for signal predication. **10×2**

**End Semester Examination, May 2017**  
**B. Tech.—Fourth/ Fifth Semester**  
**COMMUNICATION ENGINEERING-II (EC-508)**

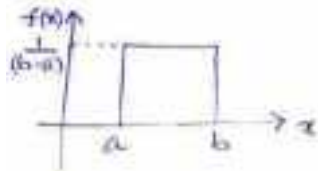
Time: 3 hrs.

Max Marks: **100**

No. of pages: **2**

Note: Attempt **FIVE** questions in all; **Q.1** is compulsory. Attempt **ANYTWO** questions from **PART-A** and **TWO** questions from **PART-B**. Each question carries equal marks.

- Q.1
- Justify the statement 'Digital transmission is more reliable'.
  - Consider an audio signal comprised of the sinusoidal term:  $s(t) = 4\cos 800\pi t$ . Find the signal to quantization noise ratio when this is quantized using 10 bit PCM.
  - What do you mean by M-ary signaling? List any two advantages of QPSK over BPSK.
  - What is a matched filter? Give expression for probability of error of matched filter.
  - Explain companding.
  - Find the constant  $k$  so that the function  $f(x) = k(x+1)$ ,  $1 < x < 4$  is a density function.  
 $0$ , otherwise  
 Also, find  $P(2 < x < 3)$ .
  - State Central Limit theorem.
  - Define autocorrelation function. Show that  $|R_x(\tau)| \leq R_x(0)$ .
  - Find the entropy corresponding to the random variable whose density function is shown below:



- Calculate the capacity of a standard 4 KHz telephone channel working in the frequency range of 300 Hz. to 3400 Hz with SNR of 32dB. **2×10**

**PART-A**

- Q.2
- Explain TDM in detail. **5**
  - What is pulse code modulation? Derive the relation between signaling rate and transmission bandwidth in PCM system. **10**
  - Explain delta modulation with suitable block diagram. What are the drawbacks of delta modulation? **5**
- Q.3
- Explain the generation and detection of binary PSK.
  - Describe MSK modulation scheme in detail. **10×2**
- Q.4
- What is an optimum filter? Derive the expression for probability of error,  $P_e$  and transfer function  $H(f)$  of optimum filter. **20**

**PART-B**

- Q.5
- Define mutual information. Show that  $I(X, Y) = H(X) - H(X/Y)$ . **5**
  - State and prove Shannon Hartley theorem for a signal of bandwidth of 3 KHz and SNR of 15.
    - Calculate the channel capacity.
    - If the BW is increased to 4 KHz and the signal is transmitted over the same channel, calculate the required SNR and percentage change in the signal power. **10**
    - Consider the DMS with symbols  $S_0, S_1, S_2, S_3, S_4$  with probabilities 0.4, 0.2, 0.2, 0.1, 0.1 respectively. Find the Huffman's code and calculate the code efficiency. **5**

- Q.6 a) Define cumulative distribution function (CDF). Write different properties of CDF. **6**  
 b) Find mean and variance of random variable  $X$  which is uniformly distributed between  $a$  and  $b$ ,  $a < b$ . **8**  
 c) Find the pdf of a linear function of a random variable  $Y$  in terms of pdf of  $X$ . Suppose  $Y = aX + b$ ,  $a \neq 0$ . **6**
- Q.7 a) The power spectral density of a stationary random process is given by:  

$$S_{xx}(f) = A, \quad -\alpha < f < \alpha$$

$$0, \quad \text{otherwise}$$
 Find the autocorrelation function. **8**  
 b) Write short notes on:  
 i) Random process transmission through linear filters.  
 ii) Cross correlation function. **6×2**

**End Semester Examination, May 2017**  
**B. Tech.–Fifth Semester**  
**MICROCONTROLLER AND INTERFACING(EC-521)**

Time: 3 hrs.

Max Marks:100

No. of pages:1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1 a) The following shows crystal frequencies of two different 8051 microcontroller based systems. Find the period of machine cycle in each case:  
 i) 12 MHz                      ii) 20 MHz  
 b) Discuss the function of RSO and RSI bits of PSW register.  
 c) Differentiate between 'RET' and 'RETI' instruction.  
 d) Write the instructions to store the contents of accumulator on external data memory location 0050 H.  
 e) Write the instruction to make register bank 2 as active register bank.  
 f) Show the contents of A and B registers after execution of following instruction:  
     MoV A, # 47 H  
     MoV B, # 25 H  
     ADD A, B  
     DA A  
 g) What is the effect of clearing EA bit of IE register?  
 h) What are different interrupts of 8051 microcontroller?  
 i) What is function of TI bit in SCON register of serial port of 8051 microcontroller?  
 j) What is function of SDC pm of ADC? 2 × 10

**PART-A**

- Q.2 a) Draw the architecture of 8051 microcontroller and explain its various blocks. 12  
 b) Explain following signals:  
     i) ACE              ii) TXD              iii) RST              iv)  $\overline{PSEN}$  8
- Q.3 a) Explain following instructions with examples:  
     i) DIV                      ii) RRC 6  
 b) Write a program to multiply two 8-bit numbers and store the 16-bits result in  $R_5$  and  $R_6$  registers. Register  $R_5$  should have lower byte of the result. 6  
 c) What are different addressing modes supported by 8051 microcontroller? Explain with examples. 8
- Q.4 a) Write a program to turn on the LED connected to P<sub>1.0</sub> for 10 ms and then turn off the same LED for 10 ms. Repeat the process continuously. 10  
 b) Explain mode-2 operation of timer for 8051 microcontroller. 6  
 c) Explain the function of TMOD register. 4

**PART-B**

- Q.5 a) Explain mode-1 operation of serial port. 8  
 b) Find the value of TH1 register needed to have 1200 baud rate. 6  
 c) Explain the function of SCON register. 6
- Q.6 a) Write a program to generate 10 KHz square wave on P<sub>2.3</sub> using timer 0 interrupt. 12  
 b) Explain the functions of following registers.  
     i) IE                      ii) IP 8
- Q.7 Interface *any two* of the following with 8051 microcontroller:



- a) 8255 (programmable peripheral interface).
- b) 8 K external data memory.
- c) ADC.

**10x2**

**End Semester Examination, May 2017**  
**B. Tech.– Fifth Semester**  
**COMMUNICATION SYSTEMS-I (EC-522)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Briefly answer:

- a) Define 'signal'. What are different types of signals?
- b) What is vestigial sideband transmission? How is it used for TV broadcast?
- c) What is the percentage power saving in SSB transmission as compared to DSB signal (Take modulation index as 1)?
- d) A FM signal is given by:  $s(t) = 10 \cos[2\pi \times 10^8 t + 2 \sin(2\pi \times 10^3 t)]$ . Find the total power in the signal.
- e) Draw the block diagram for generation of PM signal using FM modulator.
- f) What is the significance of RF section in superheterodyne receiver?
- g) What is intermediate frequency and what is its significance.
- h) Define 'noise figure'. What is its value for an ideal source?
- i) An amplifier is operating at  $17^\circ \text{C}$  with a bandwidth of 15 KHz. Find thermal noise power in Watts and rms noise voltage for a  $60\Omega$  internal resistance and a  $60\Omega$  load resistance.
- j) What do you mean by FM threshold effect? 2 × 10

**PART-A**

- Q.2
  - a) What are the elements of a Communication System? Explain their fundamental limitations. 10
  - b) What is the need for modulation in a communication system? 10
- Q.3
  - a) Describe the square law method for generating AM signal. Also explain envelope detector method for demodulation. 10
  - b) Draw the block diagram of phase cancellation SSB generation method and explain how the carrier and unwanted sideband are suppressed. What change is required to suppress the other sideband? 10
- Q.4
  - a) An angle modulated signal  $s(t)$  is given by:  
 $s(t) = 100 \cos(2\pi f_c t + 4 \sin 2000\pi t)$  where  $f_c = 1000 \text{ MHz}$ 
    - i) Determine the average transmitted power. 6
    - ii) Determine the peak frequency and peak deviation. 7
    - iii) Is this PM or FM signal. Explain. 7
  - b) Explain the generation of FM, using VCO method. 7
  - c) What are the advantages and disadvantage of FM? 7

**PART-B**

- Q.5
  - a) Name the constituent stages of AM radio transmitter and briefly give the function of each stage. 7
  - b) What is AGC? How AGC is obtained in a practical diode detector? Explain with a neat diagram. 7
  - c) What is the difference between low level and high level modulation? 6

- Q.6 a) Derive an expression for rms noise voltage at the output of passive RC low pass filter. 10
- b) Two port devices are connected in cascade. For the first stage the noise figure and available power gain are 5 dB and 12 dB respectively. For the second stage the noise figure and available power gain are 15 dB and 10 dB respectively. Determine overall noise figure. Also find equivalent noise temperature. 10
- Q.7 a) Find the expression of SNR for coherent reception with SSB modulation. 10
- b) What is the need for pre-emphasis and de-emphasis in FM? Explain with suitable diagram. 10

**End Semester Examination, May 2017**  
**B. Tech.—Fifth Semester**  
**PRINCIPLES OF COMMUNICATION (EC-605)**

Time: 3 hrs.      Max Marks:

**100**

No. of pages: **1**

Note: Attempt **FIVE** questions in all; **Q.1** is **compulsory**. Attempt **ANYTWO** questions from **PART-A** and **TWO** questions from **PART-B**. Each question carries equal marks.

- Q.1    a) What is the bandwidth in case of wideband frequency modulation?  
       b) Explain the term de-emphasis.  
       c) Explain VSB modulation.  
       d) Define the modulation index in FM.  
       e) What do you mean by the term companding?  
       f) List the advantages of SSB-SC over AM.  
       g) Define 'ASK'.  
       h) Compare PWM and PPM.  
       i) Define 'multiplexing'. Give its various types.  
       j) Compare FM with PM. **2×10**

**PART-A**

- Q.2    a) Discuss in detail various properties of Fourier Transform. **10**  
       b) List various advantages of digital communication system over analog communication system. **10**
- Q.3    a) Define 'amplitude modulation'. Derive an expression for voltage equation, modulation index and power relation in an AM wave. **10**  
       b) A 360 W carrier is simultaneously modulated by two audio waves with modulation percentages of 55 and 65 respectively. What is the total sideband power? **10**
- Q.4    a) What is FM? Explain in detail the indirect method of generation of FM. **10**  
       b) Compare NBFM and WBFM. **10**

**PART-B**

- Q.5    a) Explain the method of generation of PAM. **10**  
       b) Explain in detail the block diagram of PCM. **10**
- Q.6    a) Explain the modulation and demodulation of FSK. **10**  
       b) Draw and explain the modulation and demodulation of M-ary PSK. **10**
- Q.7    Write notes on:  
       a) Noise Figure.  
       b) Noise Temperature. **10x2**

**End Semester Examination, May 2017**  
**B. Tech.(ECE) —Sixth Semester**  
**MICROWAVE DEVICES AND CIRCUITS (EC-621)**

Time: 3 hrs.

Max Marks: **100**

No. of pages: **1**

Note: Attempt **FIVE** questions in all; **Q.1** is **compulsory**. Attempt **ANYTWO** questions from **PART-A** and **TWO** questions from **PART-B**. Each question carries equal marks.

- Q.1
- What are passive microwave devices? Give two examples.
  - What are the dominant modes in a rectangular waveguide?
  - Mention two properties of a scattering matrix.
  - Define 'velocity modulation'.
  - Give two points of difference between TED's and microwave transistors.
  - CFA stands for \_\_\_\_\_.
  - Name the technique for measurement of high microwave power.
  - Define pulse repetition frequency with reference to a radar.
  - A cylindrical waveguide has a radius of 4 cm. find the cut off wavelength for the guide operation in  $TM_{01}$  mode.
  - Define quality factor of a cavity resonator. **2×10**

**PART-A**

- Q.2
- What are the advantages and disadvantages of microwaves?
  - Explain in detail the various applications of microwave. **10×2**
- Q.3
- Show that a waveguide acts as a high pass filter. **10**
  - A rectangular waveguide has dimensions  $2.5 \times 5$  cm. Determine:
    - Guide wavelength.
    - Phase velocity.
    - Phase constant.
    - Characteristic wave impedance at a wavelength of 4.5 cm for the dominant mode. **2½×4**
- Q.4
- Derive the scattering matrix of magic tee. **10**
  - Explain in detail the working of a circulator with its applications. **6**
  - Calculate the resonate frequency of a rectangular resonator of dimensions  $a = 3$ cm,  $b = 2$  cm and  $d = 4$  cm when the mode of operation is  $TE_{101}$ . **4**

**PART-B**

- Q.5
- Explain the construction and working of a reflex klystron. **10**
  - Explain the following terms with reference to a magnetron:
    - Strapping.
    - Frequency pushing.
    - Frequency pulling.
    - Phase focusing effect. **2½×4**
- Q.6 Write short notes on (**ANY TWO**):
- GUNN diode.
  - TRAPATT diode.
  - Tunnel diode. **10×2**
- Q.7
- Explain any one technique for measurement of impedance. **5**
  - Double Minimum method is used to determine the VSWR value on a waveguide. If the separation between two adjacent nulls is 3.5 cm and that between twice minimum power points is 2.5 mm determine the value of VSWR. **5**
  - Derive the simple form of radar range equation. **10**

## End Semester Examination, May 2017

B. Tech.-Sixth Semester

### COMMUNICATION SYSTEM-II (EC-622)

Time: 3 hrs.

Max Marks: **100**

No. of pages: **2**

Note: Attempt **FIVE** questions in all; **Q.1** is compulsory. Attempt **ANYTWO** questions from **PART-A** and **TWO** questions from **PART-B**. Each question carries equal marks.

- Q.1
- What is pulse modulation? What is the difference between PAM and PTM?
  - In PCM, if the numbers of quantization levels are increased from 4 to 16, what will be the effect on bandwidth?
  - Explain FSK.
  - What is a matched filter? Write the expression for probability of error in matched filter.
  - Define probability density function. How is it related to CDF?
  - State central limit theorem.
  - A continuous signal is band limited to B Hz, sampled at Nyquist rate and the samples are quantized into 4 levels. The quantization levels  $Q_1, Q_2, Q_3$  and  $Q_4$  are assumed independent and occur with probabilities  $P_1 = P_4 = \frac{1}{8}$  and  $P_2 = P_3 = \frac{3}{8}$ . Find the information rate of the source.
  - Find the channel capacity of the following channel:

$$P(Y / X) = \begin{bmatrix} \frac{3}{4} & \frac{1}{4} \\ \frac{1}{4} & \frac{3}{4} \end{bmatrix}$$

- What do you mean by Power Spectral density function? Write its properties.
- The joint probability density functions of the random variables  $x$  and  $y$  is  $f(x, y) = k e^{-(x+y)}$  in the range  $0 \leq x \leq \infty, 0 \leq y \leq \infty$  and  $f(x, y) = 0$  otherwise. Find the value of the constant  $k$ . Also find the probability  $P(0 \leq X \leq 2; 2 \leq Y \leq 3)$ . **2×10**

### **PART-A**

- Q.2
- What is sampling? State and prove sampling theorem for low pass signal. Find the Nyquist rate for the signal:  $x(t) = 100 \cos 4000\pi t + 50 \cos^2 2000\pi t$  **10**
  - Why companding is needed? Discuss the various laws of companding. **4**
  - What is delta modulation? Explain the drawbacks of delta modulation. **6**
- Q.3
- Draw the block diagram of DPSK modulator and explain how synchronization problem is avoided for its detection. **10**
  - Write a short note on QPSK technique. List its advantages and applications. **10**
- Q.4
- What is an optimum filter? Derive the expression for probability of error,  $P_e$  and transfer function  $H(f)$  of optimum filter. **20**

### **PART-B**

- Q.5
- A random variable has an exponential PDF given by  $f(x) = a e^{-b|x|}$ , where  $a$  and  $b$  are constants. Find the relation between  $a$  and  $b$ . Also find distribution function of  $x$ . **8**
  - Explain Gaussian pdf. What is an error function? **5**
  - The random variable  $X$  has a variance  $\sigma^2$  and mean  $m$ . The random variable  $Y$  is related to  $X$  by  $Y = aX + b$ , where  $a$  and  $b$  are constants. Find the mean and variance of  $Y$ . **7**
- Q.6
- Write short notes on:
    - Random process transmission through linear filters.

ii) Cross correlation function.

**6×2**

- b) Show that if  $X(t)$  is WSS, then  $E\left[\left[X(t+\tau) - X(t)\right]^2\right] = 2[R_x(0) - R_x(\tau)]$  where  $R_x(\tau)$  is the auto correlation of  $X(t)$ .

**8**

- Q.7 a) Define 'Entropy'. Consider a binary memory less source with two symbols  $x_1$  and  $x_2$ . Show that  $H(X)$  is maximum when  $x_1$  and  $x_2$  are equiprobable. **7**
- b) State and prove Shannon Hartley theorem. A system has a channel bandwidth of 4 KHz and a SNR of 28dB at the input to the receiver. Calculate:
- Information carrying capacity.
  - The capacity of the channel if its bandwidth is doubled, while the transmitted power remains constant. **4×2**
- c) A source  $X$  has five equally likely symbols. Construct Shannon Fano code for  $X$  and calculate the efficiency of the code. **5**

**End Semester Examination, May 2017**  
**B. Tech.—Sixth Semester**  
**VLSI TECHNOLOGY AND CIRCUITS (EC-623)**

Time: 3 hrs.

Max Marks: **100**

No. of pages: **1**

Note: Attempt **FIVE** questions in all; **Q.1** is compulsory. Attempt **ANYTWO** questions from **PART-A** and **TWO** questions from **PART-B**. Each question carries equal marks.

- Q.1
- a) What are the advantages of IC's over discrete component circuits?
  - b) What is the purpose of oxidation?
  - c) Write the physical property of annealing metals.
  - d) What is vapor phase epitaxy?
  - e) Explain the advantages and disadvantages of molecular beam lithography.
  - f) Differentiate between 'wet' and 'dry etching'.
  - g) Discuss the different types of CMOS process.
  - h) What is channel length modulation and when the channel is pinched off?
  - i) Define 'rise and fall time'.
  - j) What is static RAM?
- 2×10**

**PART-A**

- Q.2
- a) Describe the VLSI design flow. **10**
  - b) Describe the evolution of IC technology. **10**
- Q.3
- a) Define 'Oxidation'. What are different oxidation techniques for growing oxide layer? **12**
  - b) What are the different processes used for the cleaning of a wafer? **8**
- Q.4
- a) Discuss molecular beam epitaxy in detail. **10**
  - b) Describe the fabrication steps for CMOS in detail. **10**

**PART-B**

- Q.5
- a) What is reactive plasma etching? Explain. **10**
  - b) Define 'metallization' in detail. **10**
- Q.6
- a) Explain the working and transfer characteristics of enhancement MOSFET. **10**
  - b) Derive an expression for trans-conductance and output-conductance. **10**
- Q.7
- a) Explain the working of CMOS inverter. **10**
  - b) Design a function  $F_1$  using CMOS inverter  $F_1 = \overline{(A+B).C}$  and also draw its stick diagram. **10**



**End Semester Examination, May 2017**  
**B. Tech.–Sixth Semester**  
**PRINCIPLES OF RADAR SYSTEMS (EC-624)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- Define 'maximum unambiguous range'.
  - If a radar produces a pulse of width  $1.5 \mu\text{s}$  with a pulse repetition frequency of 2000 per second. Find its duty cycle.
  - If the received echo signal has higher frequency than transmitted signal, the target is moving away from radar. Justify your answer.
  - What are the methods to reduce clutter in MTI radar?
  - SAR means \_\_\_\_\_.
  - What is the signal to noise ratio of an ideal radar receiver?
  - "Monopulse tracking Radar has better accuracy". Give justification.
  - What is the advantage of using staggered frequency in MTI radar?
  - Calculate the range of a target if the time taken by radar signal to travel to the target and back is  $100 \mu\text{s}$ .
  - Mention one use of duplexer in radar system. 2 × 10

**PART-A**

- Q.2
- Describe in brief the frequencies of operation of a radar. Also discuss the major applications of radar in detail. 10
  - Explain the principle of operation of a basic radar with diagram. 10
- Q.3
- What are the various factors that help in prediction of range performance of a radar? 10
  - Explain the various system losses in detail. 10
- Q.4
- A CW Radar is operating at a frequency of 6 GHz when an aircraft is approaching the radar at a radial velocity of 600 km/hr. Find the doppler shift frequency. 8
  - Explain in detail the operation of a CW radar with the help of a block diagram. 12

**PART-B**

- Q.5
- Explain the principle of operation of a pulsed dopplerradar with the help of a block diagram. 10
  - Two MTI Radar systems are operating at the same PRF but different operating frequencies. Blind speeds of these radars are such that second blind speed of first radar is equal to fourth blind speed of second radar. Find the ratio of their operating frequencies. 10
- Q.6
- What is range tracking? What is its significance in radar? Explain the process of range tracking in detail. 10
  - What is the principle of operation of a conical scan tracking radar? Briefly discuss its operation with the help of a block diagram. 10
- Q.7 Write short notes on:
- Radar receivers.

- b) Noise figure.
- c) Radar displays.
- d) Low noise front ends.

**5 × 4**

# End Semester Examination, May 2017

B. Tech.–Sixth Semester

## CONSUMER ELECTRONICS (EC-625)

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1
- What is the frequency range of audio signal?
  - Why picture frame frequency is 25 per second in India and 30 per second in USA?
  - What do you mean by Kell factor?
  - What is the need of colour difference signal and luminance signal?
  - What do you mean by primary colours?
  - What is a mod-6 counter?
  - Why do we require IF amp in a TV receiver?
  - List the components inside a LNBC.
  - If power of a signal is doubled then dB increase is \_\_\_\_\_.
  - State relationship between size of receiving antenna and frequency of the signal.  $2 \times 10$

### PART-A

- Q.2
- An audio amplifier produces 20 watt output across an 8 ohm resistance when a 5 millivolt signal is applied to its input across a  $1M\Omega$  resistor. Determine the decibel gain. 6
  - Explain the concept of dB/decade and dB/octave. 4
  - Explain any one type of microphone in detail. 10
- Q.3
- Explain how flicker is reduced with the help of interlace scanning? 10
  - Sketch and explain Vidicon monochrome camera tube in detail. 10
- Q.4
- Compare PAL, SECAM and STSC systems. 10
  - How color picture tube is different from a monochrome picture tube? Explain using diagram. 10

### PART-B

- Q.5
- Draw and explain block diagram of VCR. 10
  - Why cable TV is most appropriate choice now a days? Explain its functioning. 10
- Q.6 Write short notes on (any two) electronic gadgets:
- Xerox machine.
  - Printer.
  - Scanner. 10 × 2
- Q.7
- Explain construction and working of a air conditioner in detail. 10
  - Explain in detail various mechanism of washing machine. 10

# End Semester Examination, May 2017

## B. Tech.–SixthSemester EMBEDDED SYSTEMS (EC-626)

Time: 3 hrs.

Max Marks:100

No. of pages:2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- Draw the block diagram with the basic features of an embedded microcontroller.
  - Explain the CISC and RISC processor architecture. Also explain their advantages and disadvantages.
  - What are the different processor architecture available in PIC microcontroller?
  - What are the different fields of STATUS register? Find the status of carry flag after addition of  $0 \times 80$  and  $0 \times 80$ .
  - Write instructions for bit operations with the help of an example.
  - What do you understand by pointers and arrays?
  - Define 'Macros' with the help of examples.
  - Define and explain all the four registers used in analog to digital conversion.
  - What do you understand by the terms Prescaler and Postscaler in PIC16F877A timers?
  - What value should be loaded into TMRO register to achieve the delay of  $160\mu s$  using 3.58MHz frequency and 1:1 prescaler? 2 × 10

### PART-A

- Q.2
- For the given Intel HEX record, find each field:  
10246200464C55617630AF3F064C33 6
  - Define the function of assembler in an IDE. Also explain the file produced by an assembler. 6
  - Differentiate between microprocessor and microcontroller for following:
    - Operating frequency.
    - Software size.
    - Hardware requirement.
    - RAM. 2 × 4
- Q.3
- Which architecture is followed by PIC microcontroller? Explain the architecture with the help of block diagram. Also explain its advantages. 10
  - What is the need of reset in any digital device? What are the different situations that cause the PIC microcontroller's reset to become active? Explain all situations in detail. 10
- Q.4
- Write a program to add two 16-bit numbers and store the result on memory location 20 H, 21 H and 22 H 20 H must carry lower 8-bit, 21H must carry higher 8-bit and 22H carry the status of CARRY flag. 15
  - Explain the terms comparing and negation. 5

### PART-B

- Q.5
- What is the requirement of timers in microcontrollers? Explain the operation of timer 0 in PIC16F877A. Also explain the associated control registers. 10
  - Write a program to configure PORTB as output port. 5
  - Explain all fields of OPTION Register in brief. 5

- Q.6 a) Explain in detail master synchronous serial port module. Also explain the steps involve in performing data transmission in SPI mode. 10  
b) Explore the feature of mid-range PIC microcontroller that allows PIC microcontroller to act like an intelligent peripheral to any 8-bit data bus device. 10
- Q.7 Explain (*any two*) interfacing with PIC microcontroller:  
a) Stepper motor.  
b) Relays.  
c) Analog I/O.  
d) Serial Port. 10×2

**End Semester Examination, May 2017**  
**B. Tech.–Sixth/ Seventh Semester**  
**MICROWAVE ENGINEERING (EC-701A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- Give two examples of microwave amplifiers.
  - Mention two properties of matrices.
  - Define frequency pushing with reference to a magnetron.
  - Show that TEM wave cannot be propagated in a waveguide.
  - Define 'strip line'.
  - A rectangular cavity has dimensions  $a = 4\text{cm}$ ,  $b = 2\text{cm}$  and  $d = 6\text{cm}$ . Calculate the resonant frequency of the cavity for the dominant mode.
  - Define 'negative resistance device'.
  - Calculate the wavelength of an electromagnetic wave having a frequency of 10 GHz.
  - Define 'pulse repetition frequency'.
  - BWO stands for \_\_\_\_\_.
- 2 × 10

**PART-A**

- Q.2
- Mention the IEEE band designation for microwaves in detail. 10
  - Explain the applications of microwaves in detail. 10
- Q.3
- Give four points of similarities and four points of dissimilarities between transmission lines and waveguides. 8
  - Derive the expression for wave impedance for a TE wave. 6
  - For the dominant mode of operation in an air filled circular waveguide of diameter 4 cms find:
    - Cutoff wavelength.
    - Cutoff frequency.
    - Guide wavelength.

2 × 3
- Q.4
- Derive the scattering matrix of E Plane Tee. 10
  - Write short notes on (*any two*):
    - Hybrid Ring.
    - Phase shifter.
    - Rectangular cavity resonator.
    - Isolator.

5 × 2

**PART-B**

- Q.5
- What are the limitations of conventional tubes at microwave frequencies? Explain any four in detail. 10
  - Describe the construction and working of a travelling wave tube in detail. 10
- Q.6
- Write short notes on (*any two*):
- PIN Diode.
  - Tunnel Diode.
  - GUNN Diode.
  - IMPATT Diode.
- 10 × 2

- Q.7
- a) Double minima method is used to determine VSWR value on a waveguide. If the separation between two adjacent nulls is 3.5cm and that between twice minimum power points is 2.5mm determine the value of VSWR. 5
  - b) Explain the electronic technique for measurement of frequency in brief. 5
  - c) Explain in detail the operation of RADAR with its block diagram. 10

**End Semester Examination, May 2017**  
**B. Tech.– Fifth/Sixth/Seventh Semester**  
**MICROCONTROLLER AND APPLICATIONS (EC-702)**

Time: 3 hrs.

Max Marks:100

No. of pages:1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- Write the instructions to load the number 12 H in four register  $R_0 - R_3$ . Register bank two is active register bank.
  - What is the period of machine cycle for 8051 microcontroller based system if crystal frequency is 11.0592 MHz.
  - Write the instruction to push the contents of  $R_1$  and  $R_2$  registers on stack.
  - Show the contents of PSW register after the execution of following instructions:  
 MOV A, # 0CEH  
 ADD A, # 2 DH
  - What is the function of DPTR in 8051 microcontroller?
  - What is the function of GATE bit in TMOD register?
  - What instructions are used to enable and disable all interrupts of 8051 microcontrollers?
  - Explain the function of RB8 bit in SCON register.
  - Which register caters to the function of changing interrupt priority and how?
  - For XTAL=12MHz, Find TH1 value for 1200 baud rate. 2 × 10

**PART-A**

- Q.2
- Draw the pin diagram of 8051 microcontroller and explain the function of each pin. 10
  - Explain immediate and indirect addressing modes of 8051 microcontroller with an example. 5
  - Differentiate between 'microprocessor' and 'microcontroller'. 5
- Q.3
- Explain following instructions with examples:
 

i) SWAP	ii) ANL	
iii) MVL	iv) ADDC	10
  - Write a program to load accumulator with value of 44H and then complement it 700 times. 10
- Q.4
- Explain characteristics and operation of mode-2 of timer in 8051 microcontroller. Write down the steps to program it in mode-2. How does mode-2 differ from mode-1? 10
  - For an 8051 microcontroller with XTAL=12 MHz, generate a delay of 5 ms. 10

**PART-B**

- Q.5
- Explain Max-232 line driver. How 8051 microcontroller is connected to RS-232 communication interface with the help of Max-232? 10
  - Write a program to receive data which has been sent in serial form and send it out to port 0 in parallel form. Also save the data at RAM location 60 H. 10
- Q.6
- What are advantages of interrupt based data transfer? 5
  - Explain the functions of IE register. 5
  - Write a program to generate a square wave of frequency 1 KHz using timer interrupt. 10



- |     |   |    |
|-----|---|----|
| Q.7 | a) Interface DAC with 8051 microcontroller and write a program to generate a square wave using DAC. | 10 |
|     | b) Interface external data memory of 8K with 8051 microcontroller.                                  | 10 |

## End Semester Examination, May 2017

B. Tech.(ECE) —Sixth/ Seventh Semester

### RADAR ENGINEERING (EC-721)

Time: 3 hrs.

Max Marks: **100**

No. of pages: **1**

Note: Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt **ANYTWO** questions from **PART-A** and **TWO** questions from **PART-B**. Each question carries equal marks.

- Q.1
- a) What will be the pulse width of a radar required to give range resolution of 20 m?
  - b) What are the advantages of using staggered frequency in MTI radar?
  - c) A radar operates with a PRF of 1.2 KHz. The pulse interval is  $0.6 \mu\text{sec}$  's find PW.
  - d) Will the maximum unambiguous range of a radar increase if its PRF is increased?
  - e) Define 'propagation effects'.
  - f) A scope displays the range of the target and relative strength of echo. (**TRUE/FALSE**)
  - g) What is a delay line canceller?
  - h) Why should the first stage of a radar receiver always have a low noise figure?
  - i) A tracking radar acquires target first before tracking. (**TRUE/FALSE**)
  - j) Define 'SAR'.
- 2×10**

### **PART-A**

- Q.2
- a) How is range of a target and angular position determined in radar? Which parameters determine the maximum unambiguous range? **10**
  - b) What are the frequency bands used in a radar? What are the major applications of radar? **10**
- Q.3
- a) Derive the simple form of radar range equation. **10**
  - b) Briefly discuss the following:
    - i) Multiple times around echoes.
    - ii) Range resolution and angular resolution. **5×2**
- Q.4
- a) Explain the operation of a CW radar with the help of a block diagram. Briefly discuss its limitations. **10**
  - b) State Doppler frequency effect in a radar. Is it present, if a target is moving in a circular path around a radar station at a constant radial distance? **10**

### **PART-B**

- Q.5
- a) An MTI radar operates at a frequency of 5 GHZ. with a PRF of 1 KHZ. Find the second and third lowest blind speed of the radar. **10**
  - b) What is an MTI radar? What is its principle of operation? What are its types? Describe characteristics of each type. **10**
- Q.6
- a) Explain the principle of operation of sequential hobbing radar. Also mention its advantages. **10**
  - b) What is range tracking? What is its significance in radar? Explain the process of range tracking in detail. **10**
- Q.7 Write short notes on (**ANY TWO**):
- a) Radar receivers.
  - b) Duplexer.
  - c) Noise figure.
- 10×2**

**End Semester Examination, May 2017**  
**B. Tech.(ECE) —Sixth Semester**  
**ELECTRONIC SYSTEM DESIGN (EC-722)**

Time: 3 hrs.

Max Marks: **100**

No. of pages: **2**

Note: Attempt **FIVE** questions in all; **Q.1** is compulsory. Attempt **ANYTWO** questions from **PART-A** and **TWO** questions from **PART-B**. Each question carries equal marks.

Q.1 a) Solve the following equation by using Boolean algebra:

$$(\overline{AB})(\overline{A+B})(\overline{B+B}) = ?$$

- b) Realize the expression  $A\overline{B} + \overline{A}B$  using CMOS logic.
- c) What do you mean by look up table?
- d) Implement a full adder using half adders.
- e) What is propagation delay?
- f) What is the difference between synchronous and asynchronous sequential circuits?
- g) Write down the excitation table for SR and J-K flip flop.
- h) Explain the term state reduction.
- i) Differentiate between 'Mealy' and 'Moore state machine'.
- j) Define 'cycle and races' in brief.

**2×10**

**PART-A**

Q.2 a) Explain the design process for digital hardware.

**10**

b) Use algebraic manipulation to find the minimum SoP expression for given function

$$F = AB + \overline{A}\overline{C} + \overline{A}BC + \overline{A}\overline{B}\overline{C} + \overline{A}\overline{B}C.$$

**6**

c) Perform the following:

i)  $(7862)_{10} = (?)_2 = (?)_8$

ii) Subtract  $(76)_8$  from  $(13)_8$  using 2's complement.

**2×2**

Q.3 a) Solve the following equation using K-map:

i)  $F_1(A, B, C, D) = \sum(1, 2, 4, 5, 6, 9, 11, 13), \phi(3, 12).$

ii)  $F_2(A, B, C, D) = \sum(2, 4, 9, 10, 12, 14) + \phi(1, 3, 8).$

Design minimum cost circuit and compare its cost with combined cost of two circuits that implement  $F_1$  and  $F_2$  separately.

**12**

b) Design half adder using CMOS logic.

**8**

Q.4 a) Design a combinational circuit that will compare bits A and B, and produce one of 3 outputs:

$$A > B$$

$$A = B$$

$$A < B$$

**10**

b) Design and implement a 3 line to 8 line decoder.

**10**

**PART-B**

Q.5 a) Design a mode-6 asynchronous up-counter.

**10**

b) Convert JK flip flop into T flip flop.

**6**

c) What is register? Explain various shift register.

**4**

Q.6 a) Design a serial adder using Moore type FSM.

**12**

b) Explain one hot encoding method.

**8**

Q.7 Write short notes on:

a) Synthesis of asynchronous circuit.

**7**

- b) Hazards and their significance.
- c) State assignment.

**7****6**

**End Semester Examination, May 2017**  
**B. Tech.(ECE) —Sixth/ Seventh Semester**  
**OPTICAL COMMUNICATION (EC-723A)**

Time: 3 hrs.

Max Marks: **100**

No. of pages: **1**

Note: Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt **ANYTWO** questions from **PART-A** and **TWO** questions from **PART-B**. Each question carries equal marks.

- Q.1
- Mention the frequency ranges for visible spectrum.
  - Find the value of critical angle at core-cladding interface of a silica optical fiber having core refractive index of 1.30 and cladding refractive index of 1.25.
  - Define 'scattering'. What are its types?
  - List any four advantages of optical communication.
  - What do you understand by the term recombination in LEDs?
  - What is dark current in photo detectors?
  - What do you understand by population inversion? Support your answer with a suitable diagram.
  - Define responsivity of photo detector. Determine its value when  $3 \mu A$  current is generated with  $6 \mu W$  of incident power.
  - What is numerical aperture of an optical fiber and how is it related to relative refraction index difference  $\Delta$ ?
  - List the modulation formats used in optical communication. **2×10**

**PART-A**

- Q.2
- Draw the block diagram of optical fiber communication system and explain each block in detail. **10**
  - Compare optical fiber with other transmission media. **10**
- Q.3
- With the help of diagrams, explain total internal reflection in optical fiber using ray theory transmission. **10**
  - A multimode step index fiber with a core diameter of  $60 \mu m$  and a relative refractive index difference 1% is operating at a wavelength of  $0.80 \mu m$ . If the refractive index of core is 1.5, determine the normalized frequency for fiber. **5**
  - Differentiate between step index and graded index fiber. **5**
- Q.4
- Define external quantum efficiency. Derive its expression. **10**
  - Draw schematic representation of surface emitting LED and explain its operation. **10**

**PART-B**

- Q.5
- Draw representation diagram of stripe geometry of injection LASER and explain its operation. **10**
  - Differentiate between LED and LASER. **5**
  - Briefly discuss the quantum well LASER. **5**
- Q.6
- With the help of a diagram explain the working principle of photo transistor. **10**
  - Derive an expression for the responsivity of an intrinsic photodetector in terms of quantum efficiency. **10**
- Q.7 Write short notes on (**ANY TWO**):
- Intensity modulation.
  - Fiber couplers.
  - Multiplexing in optical communication systems. **10×2**

## End Semester Examination, May 2017

B. Tech.—Sixth Semester  
VLSI DESIGN (EC-724)

Time: 3 hrs.

Max Marks: **100**

No. of pages: **1**

Note: Attempt **FIVE** questions in all; **Q.1** is compulsory. Attempt **ANYTWO** questions from **PART-A** and **TWO** questions from **PART-B**. Each question carries equal marks.

- Q.1
- a) Differentiate between 'dry and wet etching'.
  - b) What is channel length modulation?
  - c) What are the advantages of IC's over discrete component?
  - d) Draw the NOR gate configuration using CMOS.
  - e) Why NMOS technology is preferred over the PMOS technology?
  - f) Differentiate between 'combinational' and 'sequential circuit'.
  - g) Write different operating regions of MOS transistor; also write current equation for each case.
  - h) Define 'latch-up in terms of CMOS configuration'.
  - i) What is oxidation? What is its role in IC fabrication?
  - j) Define 'dynamic and static RAM'. **2×10**

### **PART-A**

- Q.2
- a) Describe VLSI design flow process in detail.
  - b) Explain CZ crystal growing technique in detail. **10×2**
- Q.3
- a) What is diffusion? Discuss the mechanism of diffusion process in detail.
  - b) Explain vapor phase epitaxy in detail. **10×2**
- Q.4
- a) Derive the current equation for saturation and non-saturation region of operation of MOSFET.
  - b) What is scaling? Explain scaling in detail. **10×2**

### **PART-B**

- Q.5
- a) Explain the working of CMOS inverter. Also design CMOS logic circuit for  $Y = ABC\bar{C} + \bar{A}BC$ . **12**
  - b) In CMOS combinational circuit design why NAND gates are preferred over NOR gates. Explain with suitable examples. **8**
- Q.6
- a) Design the given function using CMOS technology  $F = \overline{\{(A \cdot B) + C\}} \cdot D$  and also draw stick diagram for it. **12**
  - b) Design half adder circuit using CMOS technology. **8**
- Q.7
- a) Design given function using PLA  $F = \sum(0, 2, 5, 6)$ . **8**
  - b) Explain FPGA architecture in detail. Also draw flow chart for it. **12**

**End Semester Examination, May 2017**  
**B. Tech.–Seventh/ Eighth Semester**  
**ADVANCED TELEVISION ENGINEERING (EC-801A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) Define the term interlaced scanning.
  - b) Why is AM preferred for video signal transmission?
  - c) What is a composite video signal?
  - d) Define deflection yoke with reference to a monochrome picture tube.
  - e) Calculate % interlace error if 2<sup>nd</sup> field starts with a delay of 64  $\mu$ s.
  - f) What do you understand by dark current in a vidicon camera tube?
  - g) Write two advantages of digital TV.
  - h) Why is a grounded coating provided on the outer surface of the picture tube?
  - i) Define Grassman's law.
  - j) Calculate the transmitted power for a system with modulation index of 75% and a carrier power of 8 watts. 2 × 10

**PART-A**

- Q.2
- a) Draw the block diagram of a TV receiver system and explain each block. 10
  - b) Derive an expression for the highest modulating frequency in a television system and show that it is nearly 5 MHz in the 625 B monochrome system. 10
- Q.3
- a) What is modulation index in FM transmission and how does it affect the bandwidth required for each FM channel? 10
  - b) Show that a total channel bandwidth of 7 MHz is necessary for successful transmission of both picture and sound signals in the 625 lines TV system. 10
- Q.4
- a) What type of phosphor is employed for picture tube screens? Why is a medium persistence phosphor preferred? Why is an aluminized coating provided on the phosphor screen? 10
  - b) What is the working principle of Image Orthicon camera tube? Explain its working in detail. 10

**PART-B**

- Q.5
- a) What do you understand by compatibility in TV transmission? Enumerate essential requirements that must be met to make a colour system fully compatible. 10
  - b) Describe with suitable diagram the gun arrangement and constructional details of a delta gun colour picture tube. 10
- Q.6
- a) Compare positive and negative amplitude modulation in TV systems. 10
  - b) Describe the factors that influence the choice of picture IF = 38.9 MHz and sound IF = 33.4 MHz in the 625 B monochrome TV system. 10
- Q.7
- Write short notes on (*any four*):
- a) Cable TV
  - b) LCD TV
  - c) IP TV
  - d) HDTV

e) Television via Satellite.

5 × 4



**End Semester Examination, May 2017**  
**B. Tech.–SeventhSemester**  
**DATA COMMUNICATION(EC-802)**

Time: 3 hrs.

Max Marks:100

No. of pages:1

Note: *Attempt FIVE questions in all;Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) Define the term: 'Bit rate' and 'Baud rate'.
  - b) Draw the frame format of control field for an "S" frame.
  - c) List the various advantages of parallel transmission with an example.
  - d) Expand the following terms:
    - i) VoD
    - ii) HDTV
  - e) Write the name of various channels used in ISDN.
  - f) Draw the block diagram of data communication including DTE and DCE.
  - g) Discuss the role of data link layer.
  - h) Define the term:'line encoding'.
  - i) Draw and explain synchronous TDM.
  - j) Discuss various types of protocols used in ISDN. 2 × 10

**PART-A**

- Q.2
- a) Discuss in detail various types of transmission media. 10
  - b) What is the need of standard organization? Discuss various types of standard organizations in detail. 10
- Q.3
- a) Explain various types of unipolar encoding in detail. 10
  - b) Draw and explain the following terms with examples:
    - i) RZ
    - ii) Manchester encoding.
    - iii) Bipolar AMI 10
- Q.4
- a) Discuss various methods of error correction in detail. 10
  - b) Write short notes on:
    - i) RS-232
    - ii) X.21 5 × 2

**PART-B**

- Q.5
- a) Write short notes on:
    - i) Sliding window protocol.
    - ii) Flow control. 5 × 2
  - b) Discuss in detail various types of character oriented protocols. 10
- Q.6
- a) Explain the formation of master group in FDM hierarchy. 10
  - b) Define the term:'interleaving'. Give its various types. 5
  - c) Mention various applications of codec and combo chips. 5
- Q.7
- a) Explain the structure of SONET. 10
  - b) Write short notes on:
    - i) IPTV
    - ii) VOIP
    - iii) SS7 10

**End Semester Examination, May 2017**  
**B. Tech.–Seventh/ Eighth Semester**  
**SATELLITE COMMUNICATION(EC-821A)**

Time: 3 hrs.

Max Marks:100

No. of pages:2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) What is the difference between 'active satellites' and 'passive satellites'?
  - b) Explain the terms –ascending node and descending node.
  - c) Define the following satellite terms:
    - i) Eccentricity.
    - ii) Sub-satellite point.
  - d) Define:
    - i) G/T ratio of an earth station.
    - ii) Power back-off in power amplifier.
  - e) What is CDMA? What are its advantages?
  - f) What is the laser satellite communication system?
  - g) Differentiate between 'noise temperature' and 'noise figure'.
  - h) Explain the concept of frequency reuse.
  - i) What is meant by threshold in FM detector.
  - j) A test tone of 800 Hz is used to frequency modulate a carrier. Peak deviation is 200 kHz. Calculate modulation index and bandwidth. 2 × 10

**PART-A**

- Q.2
- a) List the frequency band designations in common use for satellite services. What are the basis on which the satellite frequencies are selected? Justify why uplink frequency has to be greater than down link frequency? 12
  - b) Explain various satellite sub systems in detail. 8

- Q.3
- a) What is orbital velocity of satellite? Prove that it is given by:

$$v = \sqrt{\frac{\mu}{r}} \text{ and}$$

$$\text{Time Period } T = \frac{2\pi r^{\frac{3}{2}}}{\mu^{\frac{1}{2}}}$$

Where  $\mu = GM_E$

$\mu$  = kepler's constant

$G$  = Gravitational constant

$M_E$  = Mass of earth 10

- b) What is meant by satellite stabilization? What are the major techniques to achieve this? 10

- Q.4
- a) What is an EIRP? A satellite downlink at 12 GHz operates with a transmit power of 6W and antenna gain of 48.2dB. Calculate EIRP in dBW. 5
  - b) Explain free space loss? What are the other losses in a satellite link? 8
  - c) Derive general link equation. 7

**PART-B**

- Q.5 a) Briefly explain, why TDM is the only option for digital satellite link? Why intermodulation products are not present in TDM? 8
- b) For A SCPC-FM-FDMA system having  $S/N=33\text{dB}$  and a test tone deviation  $\Delta f = 9.1\text{kHz}$ . Calculate the bandwidth. (For a speech signal the lowest frequency is 300 Hz and highest frequency is  $f_m = 3.4\text{ kHz}$ ) Also, calculate the C/N ratio of this SCPC system. 7
- c) What is symbol error rate? How is it different from bit-error rate and what is its significance? 5
- Q.6 a) What is multiple access system? What are the techniques used? Briefly describe each. 8
- b) Explain the following:
- i) TDMA frame structure.
  - ii) Satellite switched TDMA system.
  - iii) TDMA frame acquisition and frame synchronization techniques. 12
- Q.7 Write short notes on (*any four*):
- a) Elements of digital satellite communication system.
  - b) Look angles.
  - c) VSAT
  - d) MSAT and INMARSAT
  - e) Earth sensing satellite. 5×4

**End Semester Examination, May 2017**  
**B. Tech.–Seventh Semester**  
**EMBEDDED SYSTEM DESIGN(EC-822A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

- Q.1
- a) Compare Harvard and Princeton architecture.
  - b) How do RET and RETI instructions differ?
  - c) Show the status of CY, AC and P flags after addition of 56 H and 78 H.
  - d) Explain the function of DPTR register in 8051 microcontroller.
  - e) Explain the function of PSW register in context of 8051 microcontroller.
  - f) What is loop time subroutine?
  - g) What do you mean by Watch Dog Timer reset?
  - h) What is INTSERVICE?
  - i) What is the function of IRP bit in STATUS register of PIC?
  - j) What is the function of SOC pin in ADC?
- 2 × 10

**PART-A**

- Q.2
- a) Differentiate between CISC and RISC processors. 7
  - b) What do you mean by microcontroller's memory types? 7
  - c) Write short notes on (*any two*) of following:
    - i) Clocking.
    - ii) I/O Pins.
    - iii) Peripheral devices. 2 × 3
- Q.3
- a) Draw the pin diagram of 8051 microcontroller and explain its various signals. 10
  - b) Explain various addressing modes of 8051 microcontroller with examples. 10
- Q.4
- a) Write a program to generate a square wave of 10 kHz frequency on P 2.3 using timer. 10
  - b) What are various interrupts of 8051 microcontroller? What is their priority order? Explain the function of IE and IP registers? 10

**PART-B**

- Q.5
- a) What is a PIC microcontroller? How it is different from 8051 microcontroller? 10
  - b) Explain following instructions of PIC microcontroller:
    - i) clrw
    - ii) Incfz f,w
    - iii) comf f,F
    - iv) movwf f 2½ × 4
- Q.6
- a) Write a subroutine for Timer-2 to produce 2 second delay. 8
  - b) Explain interrupt logic in PIC. 6
  - c) Discuss O/P port expansion in detail. 6
- Q.7
- a) Design a system to interface ADC with 8051 microcontroller. 10
  - b) Write a program to display "MRIU" on LCD display. 10

## End Semester Examination, May 2017

### B. Tech.–Seventh / Eighth Semester MOBILE COMPUTING (EC-823)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) Define 'mobility and portability'.
  - b) What is mobile computing?
  - c) What are HLR and VLR?
  - d) Define 'broadcast disk'.
  - e) Write an expression for reuse ratio.
  - f) What is class 0 and class 1 wireless transaction protocol?
  - g) List three stages of client of CODA file system.
  - h) For the given spectrum of 50 MHz, calculate the number of physical channels in a GSM system.
  - i) Define 'triangular routing'.
  - j) List various classes of WTP. List the characteristic of any one in brief. 2x10

#### PART-A

- Q.2
- a) What do you understand by spread spectrum multiple access technique? List various types and explain the salient features of CDMA. 10
  - b) Describe the architecture of GSM system and explain the role of HLR, VLR and AVC from mobility point of view. 10
- Q.3
- a) What is WATM? Explain the working of WATM with the help of a generic model and various access scenarios. 10
  - b) What is agent advertisement and agent discovery? Explain IP Packet delivery to and from the mobile node with the help of a diagram. 10
- Q.4
- a) List various layers of WAP. Explain the data transfer in WDP using WDP service primitives. 8
  - b) Explain snooping TCP with advantages and disadvantages in detail. 8
  - c) Explain the role of push access protocol in brief. 4

#### PART-B

- Q.5
- a) What is CODA? What are the three states of client in CODA? Explain with the structural flow diagram. 10
  - b) What are the major transport mechanisms used in Digital Audio Broadcasting system. Explain DAB frame structure in detail. 10
- Q.6
- a) What is adhoc network? Explain the working of destination sequence distance vector protocol in detail. 10
  - b) Give an overview of adhoc routing protocols in detail. 10
- Q.7 Write short notes on *any two*:
- a) Kangaroo Joey transaction model.
  - b) Team Transaction Model.
  - c) Push Architecture.
  - d) DVB for high speed internet. 10x2

# End Semester Examination, May 2017

B. Tech.–SeventhSemester

## ADVANCED MICROPROCESSORAND MICROCONTROLLER(EC-824A)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- Define 'program invisible registers' with an example.
  - What does IOPL flag do?
  - Name various segments of advanced microprocessors. What is their function? Explain in one line.
  - Explain power saver / power down mode.
  - What is the purpose of ADV signal in 80196 PC?
  - Explain RALU.
  - List down additional features of 80386 which are not present in 80286 microprocessor.
  - Differentiate between maskable and non – maskable interrupts.
  - What are level-1 and level-2 cache memory systems? Give examples of both.
  - What is super scaler architecture?
- 2x10

### PART-A

- Q.2
- Draw and explain programming model of 32 bit microprocessor. 10
  - Differentiate between real mode memory addressing and protected mode memory addressing. 10
- Q.3
- Explain the architecture of 80286 microprocessors with the help of a suitable block diagram. 10
  - Write about interrupt structure of 80186. What is PCB? 10
- Q.4
- Explain the memory system of 80386 microprocessors. 10
  - Write about virtual 8086 mode. 10

### PART-B

- Q.5
- How do you differentiate 80486 microprocessors memory management system from 80386? Explain. 10
  - Write about Pentium processors in detail. 10
- Q.6
- Draw and explain architecture of 80196 microcontroller in detail. 10
  - Differentiate between 'Princeton' and 'Harvard architecture'. 5
  - Explain the I/O ports of 80196 microcontrollers in expanded form / mode. 5
- Q.7
- How an interrupt executes? Explain programmable timers and high speed o/p's. 10
  - Explain in detail about servicing of interrupts. 10

**End Semester Examination, May 2017**  
**M.Tech. (Comm. Sys.) -Second Semester**  
**ADVANCED DIGITAL SIGNAL PROCESSING(EC-M-C-201)**

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

- Q.1 a) Find the response of discrete time LTI system with impulse response  $h(n) = \left(\frac{1}{2}\right)^n \mu(n)$  for input  $x(n) = \left(\frac{3}{4}\right)^n \mu(n)$ . Use DTFT equations for calculations.

10

- b) State and prove convolution property of DTFT.

5

- Q.2 a) Determine the linear convolution using circular convolution for following sequences:

$$x(n) = [1, 2, 1]$$

$$h(n) = [1, 2]$$

Use DFT and IDFT for calculation.

10

- b) What do you mean by unit impulse response and transfer function of a discrete time system?

5

- Q.3 a) Obtain direct form-I and direct form-II realizations for a third order IIR filter which is expressed as  $H(z) = \frac{0.28z^2 + 0.319z + 0.04}{0.5z^3 + 0.3z^2 + 0.17z - 0.2}$

10

- b) Write down the conditions for coefficients of FIR filter structure to draw linear phase FIR structure.

5

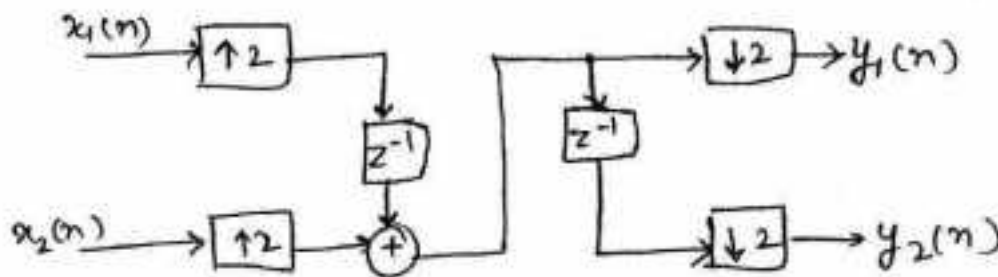
- Q.4 a) Derive mapping formula and mapping graph for IIR filter design using Bilinear transformation method.

10

- b) State advantages and disadvantages of various types of filter structures.

5

- Q.5 a) Determine input-output relationship and transfer function for following multirate system:



10

- b) Determine polyphase decomposition of Type-I and Type-II for a system having transfer function  $H(z) = \frac{1 - 3z^{-1} + 5z^{-2}}{1 - 9z^{-1} + 5z^{-2} + 6z^{-3}}$

5

- Q.6 a) Derive equation for L – Channel QMF banks.

12

- b) State advantages of multirate digital signal processing in brief.

3

**Q.7 Explain the architecture of DSP processor: TMS 3206713.**

**15**



**End Semester Examination, May 2017**  
**M.Tech. (Comm. Sys.) -Second Semester**  
**WIRELESS AND MOBILE COMMUNICATION (EC-M-C-202)**

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: *Attempt any FIVE questions in all. Each question carries equal marks.*

- Q.1 a) Explain briefly the concept of frequency re-use. Derive the expression for capacity 'C' and 'S' with 'M' where M is the number of times the cluster replicates itself. 10  
 b) Briefly explain the channel assignment strategies. 5
- Q.2 a) Explain the architecture of GSM system with the help of block diagram. 10  
 b) Calculate the number of channels in a FDMA cellular system. Given  $B_t = 12.5$  MHz;  $B_c = 30$  KHZ and  $B_g = 10$  KHZ. 5
- Q.3 Calculate the power received in a two ray Ground reflection model with the help of diagram. 15
- Q.4 a) What are the three basic propagation mechanisms? 6  
 b) Discuss briefly Okumura model for signal prediction. 9
- Q.5 a) What are multiple access techniques? Explain them briefly. 10  
 b) Explain tunneling and Encapsulation. 5
- Q.6 a) Explain IP-in-IP Encapsulation briefly. 10  
 b) List the merits and de-merits of indirect-TCP. 5
- Q.7 Write short notes on (*any two*):  
 a) Diversity techniques.  
 b) Hata model for signal prediction.  
 c) Free space path loss model.  
 d) Fading. 7½x2

**End Semester Examination, May 2017**  
**M. Tech.—Second Semester**  
**NEURAL NETWORKS AND FUZZY LOGICS (EC-M-C-206)**

Time: 3 hrs.

Max Marks: **75**

No. of pages: **1**

Note: Attempt **FIVE** questions in all. Each question carries equal marks.

- |     |   |            |
|-----|---|------------|
| Q.1 | a) Explain the structure of a biological neural network with the help of a suitable diagram. Compare biological and artificial neural networks in detail. | <b>10</b>  |
|     | b) What are the processing elements of an artificial neural network (ANN)?  | <b>5</b>   |
| Q.2 | a) Derive the Hebbian and Boltzmann learning rule.  | <b>8</b>   |
|     | b) Realize the exclusive-OR function using McCulloch Pitts neuron.  | <b>7</b>   |
| Q.3 | a) What is the importance of delta learning rule? It is called as error correction rule, Justify.   | <b>7</b>   |
|     | b) State the training and application algorithm of the adaline net.   | <b>8</b>   |
| Q.4 | a) Briefly discuss on the learning rule of a perception network.  | <b>8</b>   |
|     | b) Compare perception and Heb network.  | <b>7</b>   |
| Q.5 | a) Compare feed forward and feedback networks in detail with examples.  | <b>7</b>   |
|     | b) Explain the architecture of a back propagation network and how the error back is propagated in a BPN.  | <b>8</b>   |
| Q.6 | a) Give the architecture of single layer feed forward network and explain its training algorithm in detail.   | <b>12</b>  |
|     | b) What is the activation function used in radial basis function (RBF) network?   | <b>3</b>   |
| Q.7 | How can an artificial neural network be applied in handwritten character recognition.   | <b>15</b>  |
| Q.8 | Write short notes on ( <b>ANY THREE</b> ):  |            |
|     | a) Inference and composition.   |            |
|     | b) Neuro fuzzy system.  |            |
|     | c) Competitive learning rule.   |            |
|     | d) Membership function.   | <b>5×3</b> |

**End Semester Examination, May 2017**  
**M. Tech. (Comm. Systems)–SecondSemester**  
**ADVANCED MOBILE COMPUTING (EC-M-C-222A)**

Time: 3 hrs.

Max Marks:75

No. of pages:1

Note: *Attempt anyFIVE questions in all. Each question carries equal marks.*

- Q.1 a) Define the following terms:  
       i) Mobile computing.  
       ii) Broadcast disk.  
       iii) Triangular routing. 2 × 3  
 b) Briefly discuss the three tier architecture of mobile computing. 9
- Q.2 a) What do you understand by tunneling and encapsulation? Explain IP-in-IP encapsulation in detail. 8  
 b) Explain any one approach for IP micro-mobility support in detail. 7
- Q.3 a) What are the fundamental differences between wired (fixed) and wireless network from routing point of view? 7  
 b) Explain dynamic source routing protocol in detail. 8
- Q.4 a) Write a note on TCP over 2.5 G/3G wireless network. 7  
 b) Compare various classical TCP improvement techniques in detail. 8
- Q.5 a) What do you mean by distributed file system? Explain briefly three states of client in CODA? 8  
 b) What are the various issues of mobile computing? 7
- Q.6 a) Discuss the architecture of digital audio broadcasting in detail. 8  
 b) Explain high speed internet access using digital video broadcasting. 7
- Q.7 Write short notes on (*any two*):  
 a) Kangaroo Joey transaction model.  
 b) Frame structure of DAB.  
 c) IP packet delivery to and from the mobile node.  
 d) Security in MANET. 7½ × 2

**End Semester Examination, May 2017**  
**M. Tech. (VLSI Design & ES)–Second Semester**  
**ANALOG IC DESIGN (EC-M-VE-103)**

Time: 3 hrs.

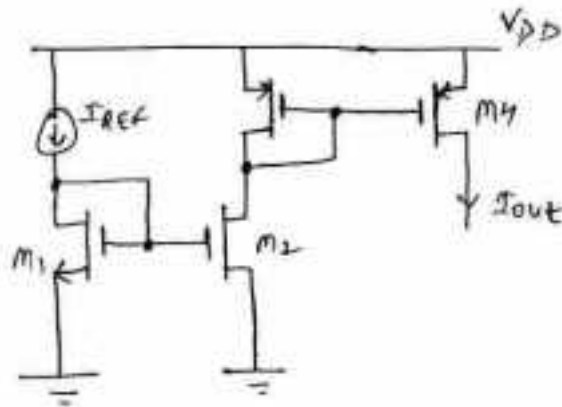
Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

- Q.1 a) What is current mirror? Explain the operation of a cascode current mirror in detail. 8  
 b) Describe the operation of a MOS differential pair as a function of input differential voltage. 7

- Q.2 a) What is the main objective of reference generation? Design a circuit to establish supply independent current source. 10  
 b) Find the drain current of transistor  $M_4$  if all of the transistors of figure are in saturation.



5

- Q.3 a) Describe various applications of operational amplifier in detail. 7  
 b) Explain the following performance parameters with reference to operational amplifier:  
 Gain, Small-Signal Bandwidth, Output swing, Large Signal Bandwidth 8

- Q.4 a) Compare the performance of MOS telescopic cascode operational amplifier and folded cascode operational amplifier. 7  
 b) Why frequency compensation is needed in operational amplifiers? How frequency compensation is achieved in case of two stage operational amplifiers? 8

- Q.5 a) What is VCO? Explain the mathematical model of VCO in detail. 7  
 b) Explain the following performance parameters of VCO's:  
 Centre frequency, Tuning range, Tuning linearity, Output signal purity. 8

- Q.6 a) What is Phase Locked Loop (PLL)? Implement a simple PLL in CMOS technology. 8  
 b) Explain the operation of a switched capacitor integrator circuit in detail. 7

- Q.7 a) Explain the working of a Dual Slope A/D converter in detail. 8  
 b) Briefly elaborate various applications of Operational Transconductance Amplifier (OTA). 7

- Q.8 Write short notes on:

- a) Analog Buffers.  
 b) Analog voltage multiplier.

7½ × 2

**End Semester Examination, May 2017**  
**M.Tech. (VLSI & ES) - Second Semester**  
**EMBEDDED SYSTEM DESIGN (EC-M-VE-104A)**

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: *Attempt any FIVE questions in all. Each question carries equal marks.*

- Q.1 a) Draw and explain the basic microprocessor system with ROM and RAM. 7½  
 b) Draw and explain the architecture of a system with DMA. Also, explain its timing diagram for different signals in DMA. 7½
- Q.2 a) Explain the basic execution flow of interrupt in RTOS environment in detail. 7½  
 b) What do you understand by task? Explain the shared data problem in task. Explain all states of task. 7½
- Q.3 a) What is combinational and sequential designing? Explain their limitations. How their limitation is overcome by RT level designing? 8  
 b) Explain Harvard and Princeton architecture. How are they different from each other? 7
- Q.4 a) Explain in detail Application Specific Instruction Set. 8  
 b) Explain timers, counters and watchdog timer in detail. Also, list their application. 7
- Q.5 a) What do you understand by write ability and storage performance of memories? Explain in detail. 7  
 b) Draw and explain the basic DRAM architecture. Also, explain fast page mode DRAM. (FPM DRAM) 8
- Q.6 Explain in detail serial protocols, parallel protocols and wireless protocols. 15
- Q.7 Describe (*any three*) in detail:  
 a) Finite state machines with data path model.  
 b) Concurrent processes.  
 c) Design process models.  
 d) Program state machine. 5x3

**End Semester Examination, May 2017**  
**M. Tech. (VLSI Design & ES)–SecondSemester**  
**REAL TIME OPERATING SYSTEM (EC-M-VE-201A)**

Time: 3 hrs.

Max Marks:75

No. of pages:1

Note: *Attempt anyFIVE questions in all. Each question carries equal marks.*

- Q.1    a) What do you mean by 'real time' and 'real time clock'? 5  
        b) Why should the embedded system RTOS be scalable? What should be the goal of an operating system? 5  
        c) How do you initiate round robin time-slice scheduling? Give an example of the need for round robin scheduling. 5
- Q.2    a) What do you mean by hierarchical RTOS? 5  
        b) How is the precedence assignment done for the tasks? How is the precedence assignment algorithm used in dynamic programming? 7  
        c) What is dynamic program scheduling? 3
- Q.3    a) List the functions of a kernel. What can be the functions outside the kernel? 7  
        b) Explain the functional parameters of a real time workload model. 5  
        c) How does a mailbox message differ from a queue message? 3
- Q.4    a) What are sockets? When are the sockets used for IPCs? 5  
        b) What are the analogies between process, task and thread? Also, list the differences between the process, task and thread. 7  
        c) Define critical section of a task. 3
- Q.5    a) What is meant by a spinning lock? Explain the situation in which the use of the spin lock mechanism would be highly useful to lock the transfer of control to a higher priority task? 10  
        b) What is mutex? 5
- Q.6    a) Explain the case study of an Embedded System for a smart card in detail. 10  
        b) List various features of  $\mu$ COSII RTOS. 5
- Q.7    a) Explain the following  $\mu$ cos II functions:  
             OS SemPend( ),  
             OS Task Create( ),  
             OS Time DlyHMSM( ) 7  
        b) List the IPC functions required and their uses in the Automatic Chocolate Vending Machine (ACVM). 8
- Q.8    Write short notes on:  
        a) Shared data problem.  
        b) Hard versus soft meal time systems. 7½ × 2

**End Semester Examination, May 2017**  
**M. Tech.–SecondSemester**  
**ADVANCED DIGITAL SYSTEM DESIGN (EC-M-VE-202A)**

Time: 3 hrs.

Max Marks:75

No. of pages:1

Note: *Attempt anyFIVE questions in all. Each question carries equal marks.*

- |     |   |        |
|-----|---|--------|
| Q.1 | a) What is sensitivity list? Where is it used?  | 3      |
|     | b) Explain different styles of modeling with examples.  | 12     |
| Q.2 | a) Explain the generic. Why is it used? Write a code for n, I/P AND gate using generic.       | 8      |
|     | b) Explain integer and floating point data types with examples.                               | 7      |
| Q.3 | a) Explain different types of operators in VHDL with examples.                                | 10     |
|     | b) Differentiate between variable 'assignment statements' and 'signal assignment statements'. | 2      |
|     | c) Perform following operations:  |        |
|     | i) "0 1 0 1 1 0 0 1"    rar – 3   |        |
|     | ii) "1 1 0 1 1 0 1 0"    sla:3  |        |
|     | iii) "1 0 1 0 0 1 1 0"    sll – 4   | 3      |
| Q.4 | a) Explain subprogram overloading in detail.  | 8      |
|     | b) Explain packages and libraries in VHDL.  | 7      |
| Q.5 | a) Design a serial adder by using Moore type FSM.   | 10     |
|     | b) What is state assignment? Explain in detail.   | 5      |
| Q.6 | Write VHDL code for simple micro computer system.   | 15     |
| Q.7 | a) Write a VHDL code for 1 bit comparator.  | 7      |
|     | b) What is the difference between PAL and PLA? Implement full adder using PLA.                | 8      |
| Q.8 | Write short notes on <i>(any two)</i> :   |        |
|     | a) FPGA   |        |
|     | b) CPLD   |        |
|     | c) RoM  | 7½ × 2 |

**End Semester Examination, May 2017**  
**M. Tech. (VLSI Design & ES)–Second Semester**  
**LOW POWER VLSI DESIGN (EC-M-VE-203)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 1

Note: *Attempt any FIVE questions in all. Each question carries equal marks.*

- Q.1 a) Discuss various considerations which are important for low power VLSI design. 5  
 b) Describe various sources of short-circuit power dissipation in a CMOS inverter in detail. 10
- Q.2 a) Explain the effect of transistor sizing and gate oxide thickness variation on power dissipation and power delay product. 10  
 b) A 32-bit off-chip bus operating at 5V and 66 MHz clock rate is driving a capacitance of 25 pF/bit. Each bit is estimated to have a toggling probability of 0.25 at each clock cycle. What is the power dissipation in operating the bus? 5
- Q.3 a) Describe gate level logic simulation in detail. Also explain various models used for the analysis of internal energy, power dissipation and comparative estimation in detail. 12  
 b) Differentiate between 'gate level logic simulation' and 'architecture level analysis'. 3
- Q.4 What is the importance of data correlation analysis of DSP systems? Explain the analysis techniques in DSP systems in detail. 15
- Q.5 a) Why is Monte Carlo simulation used? Also explain the procedure for statistical estimation of mean in Monte Carlo simulation. 9  
 b) Establish the relationship between static probability and frequency. 6
- Q.6 a) What is signal entropy? Explain its basic mathematical formulation. Also, explain the estimation of power using entropy. 10  
 b)  $P(a)$ ,  $P(b)$  and  $P(c)$  are given as input static probabilities. Find the output static probability of  $y = ab + c$  using Shannon's decomposition theorem. 5
- Q.7 a) Explain various low power techniques used for designing of SRAM cell. 10  
 b) Describe any two techniques for reduction of power dissipation in clock networks. 5
- Q.8 Write short note on (*any two*) of the following:  
 a) Pre-computation logic.  
 b) Logic Encoding.  
 c) Flow graph transformation. 7½ × 2



**End Semester Examination, May 2017**  
**M.Tech. (VLSI & ES) –First / Third Semester**  
**VLSI TECHNOLOGY (EC-M-VE-323)**

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: *Attempt any FIVE questions in all. Each question carries equal marks.*

- |     |   |    |
|-----|---|----|
| Q.1 | a) Explain Cz techniques and mathematical expression of crystal growth by Cz method.                      | 10 |
|     | b) Why is the back surface of the wafer damaged intentionally?  | 5  |
| Q.2 | a) Discuss molecular beam epitaxy. What are its advantages and disadvantages?                             | 10 |
|     | b) Differentiate between doping and auto doping.  | 5  |
| Q.3 | a) What is oxidation? Why is it needed?   | 4  |
|     | b) What are different oxidation techniques for growing oxide layer?                                       | 3  |
|     | c) Explain thermal oxidation and kinetics of thermal oxidation.   | 8  |
| Q.4 | a) What is diffusion? Discuss the mechanism of diffusion process.   | 8  |
|     | b) Explain Fick's law of diffusion. How is boron doped using diffusion?                                   | 7  |
| Q.5 | a) Draw and explain an ion implantation system.   | 10 |
|     | b) Discuss the range theory of ion implantation.  | 3  |
|     | c) What is annealing?   | 2  |
| Q.6 | a) Explain X-ray lithography.   | 8  |
|     | b) Explain raster and vector scanning process in brief.   | 7  |
| Q.7 | a) Explain in detail the dc and ac excitation of reactive plasma etching with the help of a neat diagram. | 8  |
|     | b) Explain two types of plasma surface interactions with an example.                                      | 7  |
| Q.8 | a) What is metallization? Why do we use Al for metallization?   | 8  |
|     | b) Describe different types of assembly techniques.   | 7  |

**End Semester Examination, May 2017**  
**B. Tech.–First/ Second Semester**  
**ELEMENTS OF ELECTRICAL ENGINEERING(EE-101B)**

Time: 3 hrs

Max Marks: 100

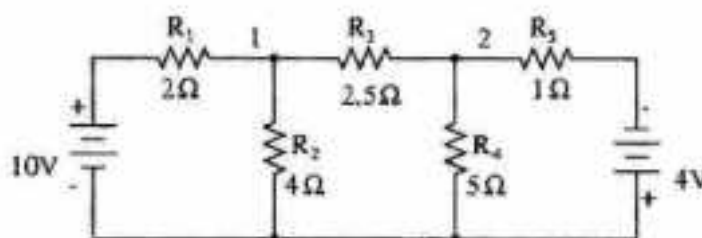
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1
- State Kirchoff's voltage law.
  - Write down the expression for slip of induction motor.
  - Define 'mesh and node of a network'.
  - What are the losses in a transformer?
  - Define 'inductive reactance'.
  - State the condition for resonance of an RLC series circuit.
  - Write the expression for emf of a transformer.
  - Write the relation between phase current and line current in a delta connected system.
  - What is a commutator in dc machine?
  - Draw the impedance triangle of RL circuit.
- 2x10

**PART-A**

- Q.2
- State and explain superposition theorem. 10
  - Find the current in the  $2.5\ \Omega$  resistor using mesh analysis. 10



- Q.3
- Explain the following terms in relation to ac circuits:
    - Phase difference
    - Power factor
    - rms value
    - Apparent power
    - Impedance.10
  - Derive the relation between line voltage and phase voltage in a star connected system. Draw the phasor diagram also. 10
- Q.4
- With the help of a neat diagram explain the construction and principle of moving coil instruments. 10
  - Explain the working of an induction type energy meter. 10

**PART-B**

- Q.5
- Explain the losses occurring in a transformer. 10
  - Distinguish between core type and shell type transformer. 10
- Q.6
- Derive the emf equation of dc generator. 10
  - Draw the parts of dc machine and briefly explain 10
- Q.7
- Explain working principle of single phase capacitor start induction motor. 5
  - Explain the working principle of synchronous generator. 5
  - Explain the working principle of 3 $\phi$  induction motor. 10

**End Semester Examination, May 2017**  
**B. Tech.–First/ Second Semester**  
**ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING**  
**(EE-102A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

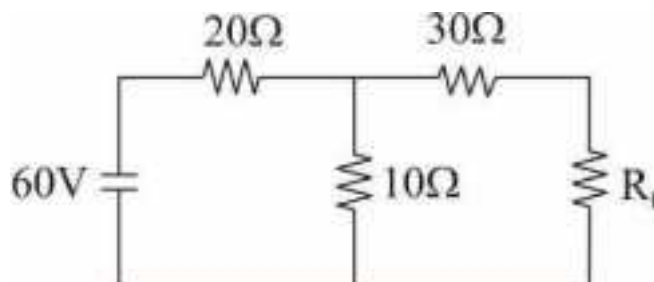
Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- State Ohm's law.
  - On what principle does the dc motor operate?
  - What do you understand by power factor of a circuit?
  - Draw the symbols for:
    - Zener Diode.
    - P-N Junction Diode.
  - Develop the truth table for a NAND gate with two inputs.
  - List various types of AC motors.
  - Define RMS value in connection with an AC circuit.
  - What is meant by a clamping circuit?
  - State maximum power transfer theorem.
  - State and explain KVL.

2 × 10

**PART-A**

- Q.2
- State and explain super position theorem. 10
  - Find  $R_L$  for which maximum power will be dissipated also find the maximum power.



10

- Q.3
- What do you mean by series resonance? Derive the condition for resonance in a series R-L-C circuit. 10
  - A voltage represented by  $v = 141.4 \sin 314t$  is applied to a series circuit containing a resistance of 5 ohms, and an inductance of 15 mH. Calculate:
    - Impedance
    - Power factor
    - RMS current
    - Equation of the current
 10
- Q.4
- Explain the working principle and construction of transformer. 10
  - Describe the principle of operation and constructional details of DC machine. 10

**PART-B**

- Q.5
- Describe the formation of P-N junction. Also explain V-I characteristics of P-N junction Diode. 10
  - What is clipping circuit? Give various configurations of clipping circuit. 10
- Q.6
- Discuss the need for biasing a transistor. 10
  - Write short notes on FET. 10
- Q.7
- Map the following standard SOP expression on a Karnaugh map:  
 $\bar{A}BC\bar{D} + ABC\bar{D} + AB\bar{C}\bar{D} + ABCD$  10
  - Convert the decimal number 740 into:

i) Binary

ii) Hexadecimal

iii) Octal

10

**End Semester Examination, May 2017**  
**B. Tech.– Third Semester**  
**NETWORK ANALYSIS AND SYNTHESIS (EE-301B)**

Time: 3 hrs.

Max Marks: 100

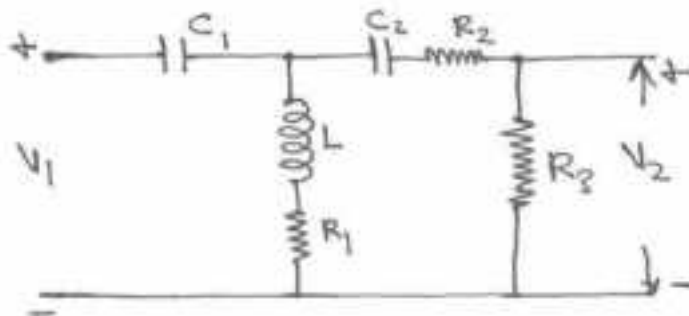
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.

- Q.1 a) Write the Laplace transformation of  $\int_{-\infty}^t f(t) dt$ .  
 b) Define 'impulse function'.  
 c) Why roots of numerator of transfer function is called zeros?  
 d) Write the property of RL network function.  
 e) What is open circuit impedance of two port network?  
 f) Derive the expression of current in RL network with d.c. excitation.  
 g) Define 'tree in graph theory'.  
 h) Determine the characteristic impedance of a high pass  $\pi$ -network filter.  
 i) What is the application of ABCD parameter?  
 j) What are the condition of reciprocity in terms of z parameters? 2 × 10

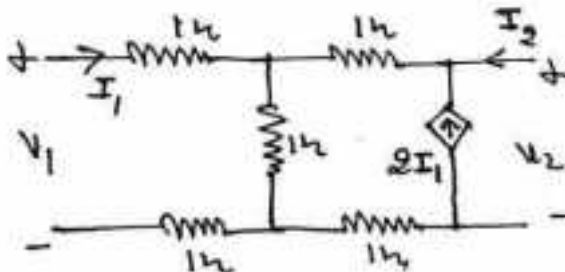
**PART-A**

- Q.2 a) Determine the hybrid parameters in terms of z-parameters. 10  
 b) Represent the given network in s-domain and find the transfer function of the network.



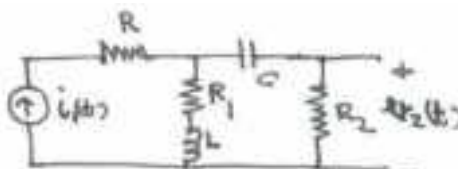
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- Q.3 a) Determine the poles and zeros of transfer function of a network shown in the figure below:



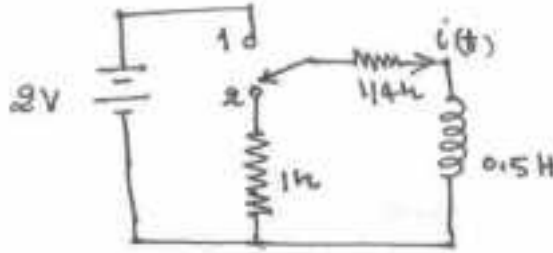
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- b) Determine the transfer function  $\frac{V_2(s)}{I_1(s)}$  of the network shown in this figure.



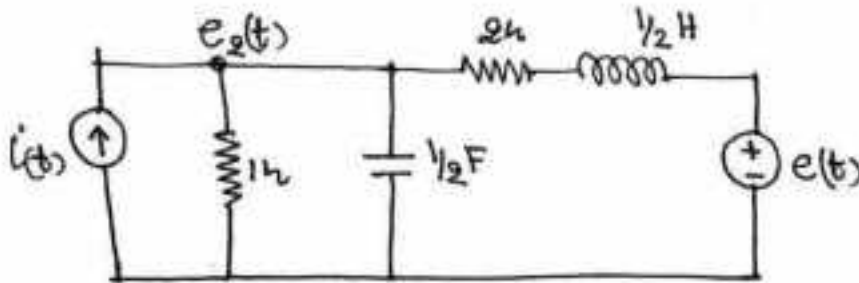
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- Q.4 a) The circuit shown in figure is initially under steady state condition with switch in position 1. The switch is moved from position 1 to 2 at  $t = 0$ . Find current  $i(t)$  after switching.



10

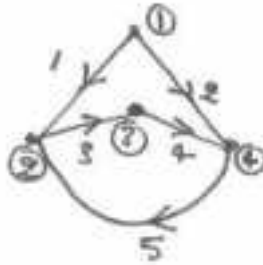
- b) Find the voltage  $e_2(t)$  in the network shown below:



10

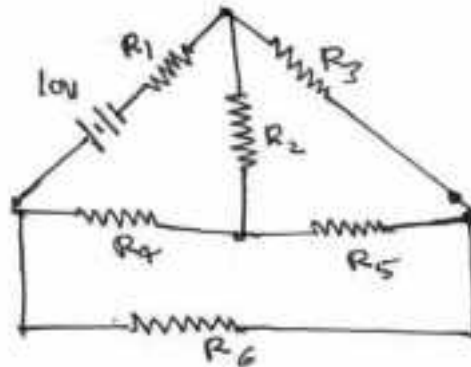
### PART-B

- Q.5 a) Determine the maximum number of possible trees of the graph given below:



10

- b) Write down the complete incidence matrix and cut set matrix of figure shown below:



10

- Q.6 a) Explain Foster-I and Foster-II realization of LC function.  
b) Realize a network, using Foster-I and Foster-II form, having

$$z(s) = \frac{2(s^2 + 4)(s^2 + 16)}{s(s^2 + 9)}$$

10

- Q.7 a) Describe the cutoff frequency of low pass prototype T-section filter. Give the working condition of Low pass filter.  
b) Design a high pass constant k-type filter with T-section having cutoff frequency 8 kHz and a nominal characteristic impedance 1 kilo ohm.

10

10

**End Semester Examination, May 2017**  
**B. Tech.– ThirdSemester**  
**ELECTRICAL MACHINES-I (EE-302B/EE-302C)**

Time: 3 hrs.

Max Marks:100

No. of pages:1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) Define all day efficiency.
  - b) Why transformer can't work on DC?
  - c) List the advantage of open delta connection.
  - d) What are the necessary condition for parallel operation of transformer?
  - e) What is the function of tertiary winding?
  - f) Distinguish between singly excited and doubly excited system.
  - g) What is the function of commutator?
  - h) Why interpoles are used in DC machines?
  - i) Why starters are used in DC motors.
  - j) Draw the power flow diagram of DC motor. 2 × 10

**PART-A**

- Q.2
- a) Derive the emf. equation of 1- $\phi$  transformer. 10
  - b) Draw equivalent circuit of 1- $\phi$  4 KVA  
 200/400V, 50 Hz  
 O.C Test : 200 V, 0.7 amp, 70 watt on L.V  
 S.C Test : 15 V, 10 amp, 80 watt on H.V 10
- Q.3
- a) What is an open delta (V-V connection)? Write the advantage and disadvantage with its application. 10
  - b) What is autotransformer. Derive the expression for Cu saving in autotransformer. 10
- Q.4
- a) Derive an expression for electro mechanical energy conversion. 10
  - b) Explain in detail energy balance and force in single excited magnetics filed system. 10

**PART-B**

- Q.5
- a) Derive the emf. equation for DC machine. Also calculate the generated emf.
    - i) With same flux and speed of 1000 rpm.
    - ii) With a flux per pole of 24 mwb and a speed of 600 rpm for 100 V and flux per pole is 20 mwb and speed is 800 rpm. 5 × 2
  - b) What is armature reaction? How armature reaction is minimized? 10
- Q.6
- a) Derive the torque equation for DC motor. 10
  - b) What are the methods to control the speed of DC motor? Explain in detail. 10
- Q.7
- a) Explain briefly Hopkinson's test for determination of efficiency of DC machine. 10
  - b) Explain how DC series motor is stopped by:
    - i) Plugging.
    - ii) Rheostatic. 5 × 2

**End Semester Examination, May 2017**  
**B. Tech.–Third Semester**  
**ELECTRICAL MEASUREMENTS(EE-303)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q. 1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) Derive an expression for dimensions of potential difference in CGS system.
  - b) Define resolution.
  - c) What is meant by deflecting torque?
  - d) Define creep in energy meters.
  - e) List the advantages of Hay's Bridge.
  - f) Define flux.
  - g) Name methods for calibration of ballistic galvanometer.
  - h) How can P.T be tested?
  - i) What are the methods of testing of potential transformers?
  - j) What are the different difficulties encountered in the measurement of high resistances?
- 2x10

**PART-A**

- Q.2
- a) Explain the working of moving iron instrument and derive its torque equation. 10
  - b) How can the range of ammeter and voltmeters be extended? 10
- Q.3
- a) Explain working of maximum demand indicator. 10
  - b) Describe construction and working of induction type energy meter. 10
- Q.4
- a) Derive the circuit of a Maxwell's Bridge and derive the condition for balance. 10
  - b) Explain how Wien's Bridge can be used for experimental determination of frequency. Derive the expression for frequency in terms of bridge parameters. 10

**PART-B**

- Q.5 Explain the working principle of a ballistic galvanometer along with its detailed analysis. 20
- Q.6
- a) Draw the equivalent circuit and phasor diagram of a potential transformer. Derive the expressions for ratio and phase angle errors. 10
  - b) Explain testing of current transformers by mutual inductance methods. 10
- Q.7 Write short notes on (*any two*):
- a) Moving Iron power factor meter.
  - b) Insulation megger.
  - c) Frequency meters.
- 10x2



## End Semester Examination, May 2017

### B. Tech.— Fourth Semester POWER SYSTEM-I (EE-304A)

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) What do you mean by non-conventional sources of energy?
  - b) What are the advantages and disadvantages of using pulverized coal in thermal power plant?
  - c) How can the conductors be arranged for overhead transmission lines?
  - d) Define 'string efficiency'.
  - e) Under what situations cost of underground system becomes comparable to overhead system?
  - f) List some types of transmission line supports.
  - g) Classify underground cables on the basis of voltage to be transmitted.
  - h) Explain factors effecting corona.
  - i) What are desirable characteristics of tariffs?
  - j) Why grading of cables are done?
- 2 × 10

#### PART-A

- Q.2
- a) Draw the schematic diagram of a thermal power plant and also explain its operation.  
15
  - b) Explain the function of following:
    - i) Dam
    - ii) Spillway
    - iii) Surge tank
    - iv) Penstock
    - v) Head work

1 × 5
- Q.3
- a) The maximum demand of a consumer is 20 A at 220 V and its total energy consumption is 8760 KWh. If the energy is charged at the rate of 20 paise per unit for 500 hrs. use of the maximum demand per annum plus 10 paise per unit for additional units, calculate:
    - i) Annual bill.
    - ii) Equivalent flat rate.

15
  - b) What do you mean by load duration curve and why it is used?  
5
- Q.4
- a) What is sag? Derive expression for sag when the support is at equal level. 10
  - b) Write a short note on 'different types of cables'. 10

#### PART-B

- Q.5
- a) Derive the expression for inductance of a 3-phase overhead line. 10
  - b) Write short notes on:
    - i) Skin effect.
    - ii) Bundling of conductor.

5 × 2
- Q.6
- a) A 2-wire D.C. distributor cable A B is 2 km long and supplies loads of 100 A, 150 A, 200 A and 50 A situated 500 m, 1000 m, 1600 m, 2000 m from the feeding point A. Each conductor has a resistance of  $0.01 \Omega$  per 1000 m. Calculate the potential

difference at each load point if a potential difference of 300 V is maintained at point A. 10

b) Discuss methods of obtaining 3-wire D.C. system. 10

Q.7 What is neutral grounding? Explain different methods for neutral grounding in detail. 20

**End Semester Examination, May 2017**  
**B. Tech.– Third Semester**  
**MEASUREMENT AND INSTRUMENTATION (EE-306)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) What is the difference between electrical and mechanical transducer?
  - b) What is the purpose of delay line in CRO?
  - c) What is the difference between electrostatic and electromagnetic deflection?
  - d) Define 'resolution and quantization error'.
  - e) What do you mean by duty cycle? What is its value for square wave?
  - f) What are the types of distortion?
  - g) What do you mean by signal conditioning?
  - h) What types of electrodes are used in EEG?
  - i) What are the type of sweeps?
  - j) Differentiate between primary and secondary transducer. 2 × 10

**PART-A**

- Q.2
- a) Explain the construction and working of LVDT. 10
  - b) Explain the working, construction of the transducer used to measure temperature. 10
- Q.3
- a) Explain the various elements in block diagram of ECG measurement. 10
  - b) Write a short note on 'instrumentation amplifier'. 10
- Q.4
- a) What are the major components of CRT? Explain each in detail. 15
  - b) What is the need of time base generator in CRO? 5

**PART-B**

- Q.5
- a) Draw and explain the block diagram of square wave pulse generator. 10
  - b) Explain spectrum analyzer with its block diagram. 10
- Q.6
- a) Explain the block diagram of data acquisition system. 10
  - b) What is PLL? Explain PLLIC 565 and its application in detail? 10
- Q.7
- a) Explain the working and block diagram of universal counter. 10
  - b) What is the principle of a digital voltmeter? What are its various types? Explain any one in detail. 10

**End Semester Examination, May 2017**  
**B. Tech.–FourthSemester**  
**ELECTRICAL MACHINE-II (EE-401A)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1 a) Under what condition, the slip in an induction motor is:  
 i) Negative ii) Greater than one.  
 b) What are two fundamental characteristics of rotating magnetic field?  
 c) What are the advantages and disadvantages of circle diagram method of predetermining the performance of 3-phase induction motor.  
 d) What is cogging of induction motor?  
 e) What is the effect of change in input voltage on starting torque of induction motor?  
 f) What is the use of shading ring in shaded pole motor?  
 g) Why single phase induction motor has low power factor?  
 h) Where the damper winding is located? What are their functions?  
 i) What are the advantages and disadvantages of three dark lamp method of synchronizing?  
 j) What is 'V' and 'inverted V' curve of synchronous motor? 2x10

**PART-A**

- Q.2 a) Derive the relationship for torque developed by 3-phase induction motor. Draw a typical torque slip characteristics and deduce the condition for maximum torque. 10  
 b) A 6-pole, 3 phases, 50Hz induction motor develops a maximum torque of 30 Nm at 960 rpm. Determine the torque exerted by the motor at 5% slip. The motor resistance per phase is 0.6 ohm. 10
- Q.3 Explain (*any two*) from the following:  
 a) DOL.  
 b) Auto transformer starter.  
 c) Star-Delta starter. 2x10
- Q.4 Write note on following:  
 a) Starting of single phase induction motor.  
 b) Capacitor Motor.  
 c) Shaded pole motor.  
 d) Universal Motor. 5x4

**PART-B**

- Q.5 a) Explain the different methods of excitation system of alternator. 10  
 b) Define and explain synchronous impedance method of determining voltage regulation of an alternator. 10
- Q.6 a) Explain the power developed in synchronous motor. 10  
 b) Explain V-curves of synchronous motor. What are main characteristics of a synchronous motor? 10
- Q.7 State different types of permanent magnet brushless motor. Describe in detail the working and construction features of PMBL motor. 20

**End Semester Examination, May 2017**  
**B. Tech.–Fourth Semester**  
**ELECTRONIC INSTRUMENTATION (EE-402B)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) What are the basic requirements of a transducer?
  - b) What are the common materials used for piezoelectric transducers?
  - c) Enlist the applications of CRO.
  - d) What is difference between analog storage oscilloscope and digital storage oscilloscope?
  - e) What are the different types of leads used in EEG?
  - f) How does a spectrum analyzer functionally differ from a wave analyzer?
  - g) How does an amplifier introduce harmonic distortion of a signal in the output?
  - h) Why are digital instruments becoming popular?
  - i) What are the essential functional operations of a digital data acquisition system?
  - j) What is the difference between 3-digit and  $3\frac{1}{2}$  digit meters? 2 × 10

**PART-A**

- Q.2
- a) Explain the construction and principle of working of a linear voltage differential transformer (LVDT). Explain how the magnitude and direction of the displacement of core of an LVDT detected. 12
  - b) Describe the construction, theory and working of thermocouples. Describe the different types of compensations used and also the methods of measurement of their output voltage. 8
- Q.3
- a) Draw and explain block diagram of EMG measurements. 10
  - b) Describe in brief the three leading systems used in ECG. 10
- Q.4
- a) Derive an expression for vertical deflection of an electron beam in a CRT. 10
  - b) Describe the principle of working and circuit diagram of a digital oscilloscope. 10

**PART-B**

- Q.5
- a) Explain the working of a pulse generator. What are specific requirements of pulse output? 10
  - b) What do you understand by total harmonic distortion? Explain the function of a fundamental suppression harmonic distortion analyzer with the help of a block diagram? 10
- Q.6
- a) Draw a block diagram of an AC signal conditioning system and explain the function of each block. 10
  - b) Explain voltage controlled oscillator with its block diagram. Also give applications of VCO. 10
- Q.7
- a) Describe the working of a universal time counter with the help of a circuit diagram. 10
  - b) Explain the function of a ramp type digital voltmeter. 10

**End Semester Examination, May 2017**  
**B. Tech.— Fourth/ Fifth Semester**  
**SWITCH GEAR AND PROTECTION (EE-403A)**

Time: 3 hrs.

Max Marks: 100

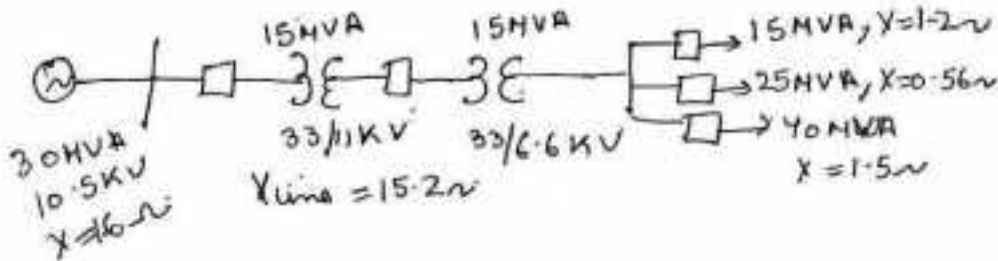
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Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.

- Q.1
- What are the advantages of per unit computations?
  - What are open conductor faults?
  - For operator 'a'. Show that:  $1 + a + a^2 = 0$ .
  - List few causes of faults.
  - Define current chopping.
  - What are the different zones of protection?
  - The pickup value of relay is 7.5 A. and fault current in relay coil is 30 A. Find its plug setting multiplier.
  - Why is it necessary to protect the lines and power equipments of power system against over voltages?
  - Explain in brief the phenomenon of lightning.
  - What is neutral grounding?
- 2 × 10

**PART-A**

- Q.2
- Explain in detail how transients occur in synchronous machine. 10
  - Draw the per unit impedance diagram of power system below:



- 10
- Q.3
- Derive an expression for fault current for double line to ground fault by symmetrical components method. 10
  - A 3-phase, 11 KV., 10 MVA. alternator has sequence reactance of  $X_0 = 0.05$  p.u.,  $X_1 = 0.15$  p.u. and  $X_2 = 0.15$  p.u. If the generator is on no-load, find the ratio of fault current for L-G faults to that when all the 3-phases are short circuited. 10
- Q.4
- Explain with neat sketches the construction and working of the following circuit breakers:
    - Plain explosion pot.
    - Cross jet explosion pot.5 × 2
  - A circuit breaker is rated as 1500 A., 1000 MVA., 33 KV., 3-second, 3-phase oil circuit breaker find:
    - Rated normal current.
    - Breaking capacity.
    - Rated symmetrical breaking current.
    - Rated making current.
    - Short-time rating.10

**PART-B**

- Q.5 a) Explain in detail the application of Merz-price circulating current principle for protection of an alternator. 15  
 b) What is biased differential beam relay? 5
- Q.6 a) Describe construction and principle of operation of induction type directional over current relay. 10  
 b) Write short notes on:  
 i) Definite distance relay.  
 ii) Time-distance relay. 5×2
- Q.7 a) Explain in detail construction and principle of operation of:  
 i) Expulsion type lightning arrester.  
 ii) Valve type lightning arrester. 5×2  
 b) What are causes of over voltages? 10

**End Semester Examination, May 2017**  
**B. Tech.– Fourth Semester**  
**PRINCIPLES OF COMMUNICATION (EE-404)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANY TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- Define 'signal'. What are different types of signals?
  - What is the percentage of the power saving in SSB transmission as compared to DSB signal? (Take modulation index as 1)
  - What are the advantages of vestigial sideband over SSB?
  - The modulating frequency in frequency modulation is increased from 10 KHz. to 20 KHz. The bandwidth is \_\_\_\_\_.
    - Doubled
    - Halved.
    - Increased by 20 KHz.
    - Increased tremendously.
  - Draw the block diagram for generation of FM signal using PM modulator.
  - State sampling theorem:  
 if  $x(t) = \cos \frac{2\pi t}{T} \cdot \sin \frac{4\pi t}{T}$  is to be sampled, what is the maximum sampling interval.
  - What is aliasing effect? Suggest methods to eliminate it.
  - Differentiate between 'ASK' and 'FSK'.
  - Explain M-ary signaling. What are its advantages?
  - A cascade in a receiving system comprises of three stages with noise figures  $F_1, F_2, F_3$  and gains  $G_1, G_2, G_3$ . Write the expression for overall noise figure.  $2 \times 10$

**PART-A**

- Q.2
- What are the elements of a communication system? Explain each in detail. 8
  - Define the term: 'modulation'. Explain the need for modulation. 6
  - Determine whether the following signals are periodic, in case its periodic specify its fundamental period. 6
- Q.3
- Derive the expression for the transmission efficiency of AM wave. Assume, sinusoidal modulating signal. 8
  - Explain synchronous demodulation method for AM detection. Evaluate the effect of phase and frequency error in the local oscillator on synchronous DSB demodulation. 7
  - Describe vestigial sideband transmission in detail. 5
- Q.4
- An angle modulated signal  $s(t)$  is given by:  
 $s(t) = 100 \cos(2\pi f_c t + 4 \sin 2000\pi t)$ . Where  $f_c = 1000 \text{ MHz}$ . Determine:
    - The average transmitted power.
    - Peak deviation and bandwidth required. 5
  - With the help of circuit diagram, explain balanced slope detection method for FM wave. 8
  - Explain the difference between:
    - NBFM and WBFM.
    - Pre-emphasis and De-emphasis.  $3\frac{1}{2} \times 2$

**PART-B**



- Q.5 a) What are different types of pulse modulation techniques? Explain how PPM is generated from PWM. 7
- b) Explain PCM. Find out the following for a signal with bandwidth 20 KHz and digitally encoded using PCM.
- Nyquist rate.
  - If the samples are quantized into 256 levels, determine the number of binary digits required to encode the quantized samples.
  - Determine the maximum bandwidth. 8
- c) Draw neat block diagram of delta modulator and explain its working. 5
- Q.6 a) Explain the working of differential PSK system. 10
- b) Define spread spectrum. List the two spread spectrum technique and explain any one of them in detail. 10
- Q.7 a) Define 'Noise'. What is the cause of thermal noise for a bandwidth of 100 KHz, calculate the thermal noise voltage generated by two resistors of 50 and 100  $K\Omega$ , when they are connect in series and in parallel. 10
- b) What is meant by noise figure? The signal power and noise power measurement at the input of an amplifier are 150  $\mu W$  and 1.5  $\mu W$  respectively. If the signal power at the output is 1.5 W and noise power is 40  $\mu W$  , calculate the amplifier noise figure. 10

# End Semester Examination, May 2017

B. Tech.— Fourth Semester

## POWER SYSTEM ENGINEERING (EE-406)

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.

- Q.1
- What do you mean by thermal efficiency of a steam power station?
  - Define load curve and load duration curve.
  - What is nuclear reactor?
  - List various types of loads on the power system.
  - What is string efficiency of insulators?
  - What is meant by resonant earthing?
  - What is the need for transposition of conductors?
  - Explain depreciation.
  - What do you understand by neutral grounding?
  - A consumer has a maximum demand of 200 KW at 40% load factor. If the tariff is ₹100/- per KW of maximum demand plus 10 paise per kWh, find the overall cost per kWh. 2 × 10

### PART-A

- Q.2
- Draw the schematic diagram of nuclear power station and discuss its operation. 10
  - Given the comparison of steam power plant, hydroelectric power plant and diesel power plant on the basis of operating cost, initial cost, efficiency, maintenance cost and availability of source of power. 10
- Q.3
- Define the following terms:
    - Demand factor.
    - Load factor.
    - Diversity factor.
    - Plant capacity factor.
    - Plant use factor. 2 × 5
  - Discuss the important points to be taken into consideration while selecting the size and number of generating units. 5
  - A power station has the following daily load cycle:

Time in Hours	6-8	8-12	12-16	16-20	20-24	24-6
Load in MW.	20	40	60	20	50	20

Plot the load curve and load duration curve. Also, calculate the energy generated per day. 5

- Q.4
- Derive an expression for Sag considering effect of wind and ice loading. 10
  - Explain the construction of 3-conductor cable. 10

### PART-B

- Q.5 With neat diagram, explain the complete a.c system for distribution of electrical energy. 20
- Q.6
- How regulation and transmission efficiency are determined for short transmission lines. 10
  - Derive an expression for the capacitance of a single phase overhead transmission line. 10

Q.7	a) Explain different types of earthing. b) What is neutral earthing?	15 5
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**End Semester Examination, May 2017**  
**B. Tech.–Fifth / Sixth Semester**  
**CONTROL SYSTEM ENGINEERING (EE-501A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

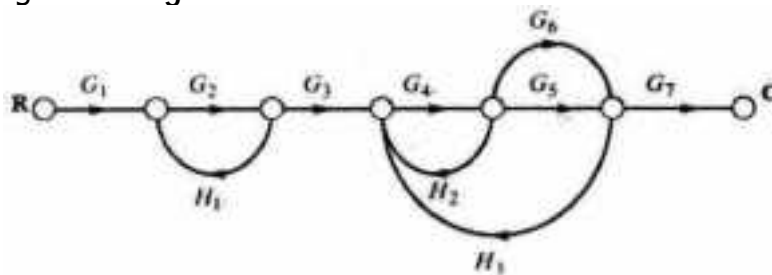
Q.1 Answer the following:

- Differentiate between 'open loop' and 'closed loop system'.
- What do you mean by order of a system?
- What is phase cross over frequency?
- Define 'rise time of a second order system'.
- Define 'characteristic equation'.
- What do you mean by break away point in root locus analysis?
- Draw an electrical network for lead lag compensation.
- Define 'phase margin'.
- Draw the polar plot of transfer function  $k/s^2(1+sT)$ .
- Define 'state of a system'.

2 × 10

**PART-A**

- Q.2 a) Obtain the overall transfer function  $\frac{C(s)}{R(s)}$  of the signal flow graph shown below in figure using Mason's gain formula.



10

- b) Find the transfer function of a field controlled dc motor.

10

- Q.3 a) Explain the different test signals used in analysis of control system. 10
- b) Determine the position, velocity and acceleration error constants of a unity feedback control system with forward path gain given as  $\frac{100}{s^2(s+2)(s+5)}$ . Also find the steady state error due to an input  $r(t) = 2 + 5t$ . 10

- Q.4 a) Explain Routh Hurwitz criterion. Using this criterion, find the stability of characteristic equation given as  $2s^5 + s^4 + 2s^3 + 4s^2 + s + 6 = 0$ . 10
- b) Draw the root locus of a system with  $G(s)H(s) = \frac{K}{(s+1)(s+2)(s+3)}$  when K is varied from 0 to  $\infty$ . 10

**PART-B**

- Q.5 a) A unity feedback control system has  $G(s)H(s) = \frac{10}{s(1+0.05s)(1+0.01s)}$ . Draw the Bode plot. 10  
 b) State and Explain Nyquist stability criterion. 10
- Q.6 Write short notes on (*any two*):  
 a) Stepper motor and its applications.  
 b) DC servomotor.  
 c) Synchros. 10×2
- Q.7 a) Discuss a lag compensator using an electrical network. Derive its transferfunction. Also draw its Bode plot. 10  
 b) Obtain the state space representation for a system characterized by the differential equation  $\frac{d^3y}{dt^3} + 10\frac{d^2y}{dt^2} + 3\frac{dy}{dt} + 9y = 9u(t)$ , where  $y$  is the output and  $u$  is the input to the system. 10

**End Semester Examination, May 2017**  
**B. Tech.—Fourth / Fifth Semester**  
**POWER ELECTRONICS (EE-502A / EE-502B)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Briefly answer:

- a) Define 'latching current'.
- b) What is snubber circuit?
- c) Explain string efficiency.
- d) What are the application of power electronics?
- e) Explain dv/dt rating of SCR.
- f) What is time ratio control in chopper?
- g) What are the industrial application of inverter?
- h) Define 'extinction angle'.
- i) What is the function of free-wheeling diode?
- j) Draw the circuit of step up chopper.

2 × 10

**PART-A**

- Q.2 a) Explain the construction details and working of IGBT. Also enumerate its applications. 10  
b) What are the various types of power diodes? 10
- Q.3 a) What is the difference between forced and natural commutation. Explain any one forced commutation technique in detail. 12  
b) Explain R-firing scheme with suitable circuit diagram and waveform. 8
- Q.4 a) Explain the working of single phase full wave converter with RLE load. Support your answer with appropriate waveform and circuit diagram. 10  
b) A single phase full converter feeds RLE load with  $R = 6\Omega$ ,  $L = 6mH$  and  $E = 60V$ . The ac source voltage is 230 V, 50 Hz. For continuous conduction find average value of load voltage and load current for firing angle delay  $\alpha = 50^\circ$ . 10

**PART-B**

- Q.5 a) Discuss the working of three phase  $120^\circ$  mode bridge inverter with appropriate voltage waveform. 15  
b) Compare VS I and CS I. 5
- Q.6 a) What is step up chopper? Find the expression of load voltage for step up chopper. Draw appropriate circuit diagram and waveform. 10  
b) Explain the working of type E chopper. 10
- Q.7 a) What is cycloconverter? What are its various type? Explain any one in detail with appropriate waveforms of load voltage and current. 10  
b) Explain the working of a single phase voltage controller with R load. Draw the suitable waveform of load voltage and load current. 10

**End Semester Examination, May 2017**  
**B. Tech.–Fifth Semester**  
**ELECTRICAL MACHINE DESIGN (EE-503)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q. 1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer in brief:

- a) What do you understand by specific electrical loading of an electrical machine?
- b) What factors should be considered while selecting number of poles of a DC machine?
- c) Name different types of enclosures used in electrical machines.
- d) Why are circular coils preferred over rectangular coils for winding of a transformer?
- e) What will happen if rotor slots of an induction motor are made equal to the stator slots?
- f) Define 'output coefficient'.
- g) What cooling methods can be employed for waterwheel generators?
- h) Give advantages of computer aided design of electrical machines.
- i) Define 'leakage coefficient'.
- j) What do you understand by synchronous cusps and how can it be avoided? 2x10

**PART-A**

- Q.2
  - a) Discuss briefly different types of ventilation systems used in electrical machines. 8
  - b) An electrical machine has a heating time constant of 160 min and cooling time constant of 200 minutes. The final temperature rise on a full load of 55°C is attained when the machine works on full load for 30 minutes followed by a stationary period of 50 minutes and so on. Estimate the maximum temperature rise of the machine. 8
  - c) Differentiate between 'continuous and 'non-continuous duty cycles'. 4
- Q.3
  - a) Derive the output equation of a 3-phase transformer. 10
  - b) Name and explain cooling methods employed in transformers. 10
- Q.4
  - a) Derive an expression for overall design of electromagnetic coil. 10
  - b) Calculate mnf for airgap of a rotating electrical machine. 10

**PART-B**

- Q.5
  - a) Develop the expression for design of field winding of DC machine. 10
  - b) Find main dimensions of a 10 MVA, 11 kV, 50 Hz, 150 rpm, 3- $\phi$  water wheel generator. The average gap density =  $0.65 \text{ wb/m}^2$  and ampere conductors/metre are 40,000/- ac. Maximum peripheral speed is 65 m/s. 10
- Q.6
  - a) Derive the output equation of a synchronous machine. Explain the significance of specific loadings. 10
  - b) Discuss various cooling and ventilation methods for alternators. 10
- Q.7 Write short notes on:
  - a) Design of rotor bars and slots in induction machine. 10
  - b) Hybrid techniques and optimization used in computer aided design of electrical machines. 10

**End Semester Examination, May 2017**  
**B. Tech.–Fifth Semester**  
**POWER SYSTEM PROTECTION (EE-521)**

Time: 3 hrs.

Max Marks: 100

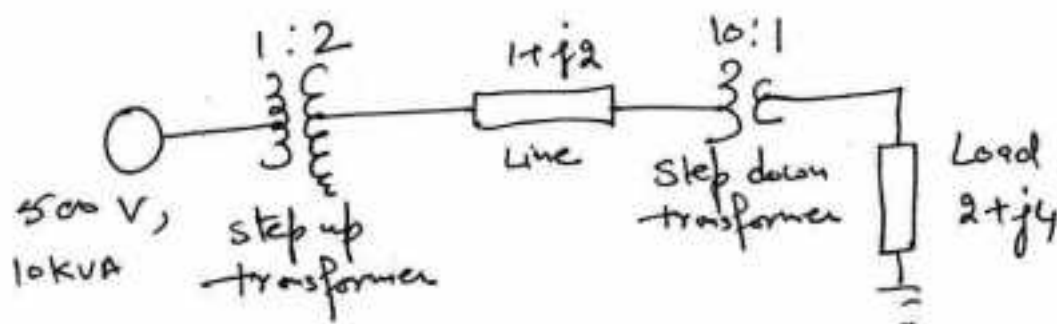
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1
- Give advantage of per unit system.
  - List two methods of arc interruption.
  - Name different types of faults.
  - Mention any two advantages of vacuum circuit breaker.
  - Define the term: 'breaking capacity in circuit breaker'.
  - What is meant by current chopping?
  - Compare SLG fault and  $\phi$ - $\phi$  fault when generator neutral is earthed/grounded solidly.
  - Can current transformer secondary winding be open circuited? Justify your answer.
  - Define restriking voltage with the help of neat waveform.
  - Give reasons for generation of overvoltage.
- 2 × 10

**PART-A**

- Q.2
- Show that the power in 3- $\phi$  circuit can be calculated from symmetrical components. 10
  - Figure shows are line diagram for a single-phase power system where a generator supplies a load through a step-up transformer, a transmission line and a stepdown transformer. Assuming the transformer to be ideal, calculate the per unit current.



10

- Q.3
- Derive the expression for voltages and draw the sequence diagram of line to ground fault in 3- $\phi$  system. 10
  - A 15 MVA, 6.9 kV generator, star connected has +ve, -ive and zero sequence reactances of 25%, 25% and 8% respectively. A reactor with 6% reactance based on rating of the generator is placed in line from ground to neutral. A line to line fault occur at terminals of generator when it is operating at rated voltage and disconnected from system. Find the initial symmetrical rms line and ground wire currents and line to neutral voltages.
    - If the fault does not involve ground.
    - If the fault is solidly grounded at the instant of its occurrence.

20
- Q.4
- Describe the construction, working principle of vacuum circuit breaker with help of neat sketch. Also list its application. 12



b) Define/Explain:

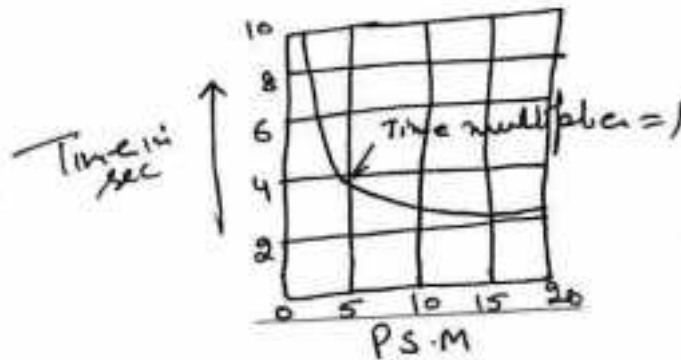
- i) Current Chopping
- ii) Recovery voltage.
- iii) R.R.R.V.
- iv) Resistance interruption for arc.

2 × 4

### PART-B

- Q.5 a) What are fundamental requirement of protective relaying? Explain the construction and operation of electromagnetic relays. 12
- b) Derive the torque equation for induction type relay. 8

- Q.6 a) A 20 MVA transformer which may be called upon to operate at 35%- overload, feeds 11 kV bus-bar through circuit breaker. Other circuit breaker supply outgoing feeders. The transformer circuit breaker is equipped with 1000/5 amp CTs and the feeder circuit breaker with 400/5A CTs and all set of CTs feed induction type over current relay. The relay on feeder circuit breaker have a 125% plug setting and 0.3 time setting. If a 3- $\phi$  fault current of 500 amp flows from the transformer to one of the feeders, find the operating time of feeder relay, Plug setting of transformer relay and its time setting assuming a disseminative time margin of 0.5 sec.



- b) Explain working of mho/admittance relay.

10

10

- Q.7 a) Explain the construction and working of lighting arrestor. 10
- b) What are the reasons for generation of switching over-voltages, how we can control these voltages. 10

**End Semester Examination, May 2017**  
**B. Tech – Sixth Semester**  
**ELECTRICAL DRIVES (EE-602A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- What are the advantages of electrical drives?
  - What may be the minimum and maximum value of slip?
  - Name the essential parts of electric drive system.
  - State the disadvantages of using a motor of wrong rating.
  - What is duty cycle?
  - Which motor is used in an electric hoist system?
  - Name two methods of speed control of a D.C. motor.
  - Name two methods of speed control of an induction motor.
  - What is plugging?
  - A motor speed variation from no load to full load is 50%. What will be the slip of the motor at full load? 2 × 10

**PART-A**

- Q.2
- What are the different components of an electric drive? Explain their function. 10
  - A 200 V, 10.5 A, 2000 rpm shunt motor has the armature and field resistance of 0.5 and 400  $\Omega$  respectively. It drives a load whose torque is constant at rated motor torque. Calculate motor speed if the source voltage drops to 175 V. 10
- Q.3
- Explain the important features of various braking methods of D.C. motors. 10
  - A 220 V, 200A, 800 rpm D.C. separately excited motor has an armature resistance of 0.06  $\Omega$ . The motor armature is fed from a variable voltage source with an internal resistance of 0.04  $\Omega$ . Calculate internal voltage of the variable voltage source when the motor is operating in regenerative braking at 80% of the rated motor torque and 600 rpm. 10
- Q.4
- Explain the working of a fully controlled rectifier fed separately excited D.C. motor operating in forward motoring.
  - A 200 V, 875 rpm, 150 A separately excited D.C. motor has an armature resistance of 0.06  $\Omega$ . It is fed from a single phase fully controlled rectifier with an A.C. source voltage of 220 V, 50 Hz. Assuming continuous conduction mode, calculate.
    - Firing angle for rated motor torque and 750 rpm.
    - Motor speed for  $\alpha = 160^\circ$  and rated torque. 10 × 2

**PART-B**

- Q.5
- What is a chopper? Explain the chopper control D.C. drives. 10
  - Explain the speed control of three phase induction motor using stator voltage control method. 10
- Q.6
- Explain at maximum torque, the slip is directly proportional to the rotor resistance. Also derive the expression for maximum torque. 10
  - Explain the frequency control method for speed control of three phase induction motor. 10
- Q.7
- Explain phase locked loop control. 10

- b) Explain the working of a dual converter fed separately excited D.C. motor drive. 10

**End Semester Examination, May 2017**  
**B. Tech – Sixth Semester**  
**POWER SYSTEM-II (EE-603A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.

Q.1 Answer briefly the following questions:

- a) What is the main information obtained from load flow study?
- b) List the factors which affect transient stability.
- c) Compare incidence and augmented incidence matrix.
- d) Draw a simple per phase model of a cylindrical rotor synchronous machine.
- e) Write the significance of using per unit system.
- f) Write Swing equation?
- g) What is Jacobian matrix?
- h) A voltage controller bus is treated as a load bus in subsequent iteration when its \_\_\_\_\_ limit is violated.
- i) State the importance of automatic voltage regulator.
- j) What is the function of tie line in a power system network?

2 × 10

**PART-A**

Q.2 a) Explain in detail about the per-phase model of synchronous machine, transmission line and transformer. 10

- b) Draw the impedance diagram for the electric power system shown in figure below showing all impedance in per unit on a 100-MVA base. Choose 20 KV as the voltage base for generator. The three phase power and line-line ratings are given below:

$G_1 - 90\text{MVA}, 20\text{KV}, X = 9\%$

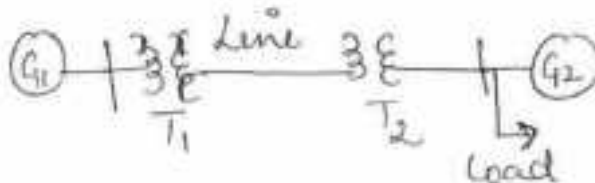
$T_1 - 80\text{MVA}, \frac{20}{200}\text{KV}, X = 20\%$

$T_2 - 80\text{MVA}, \frac{200}{20}\text{KV}, X = 20\%$

$G_2 - 90\text{MVA}, 18\text{KV}, X = 9\%$

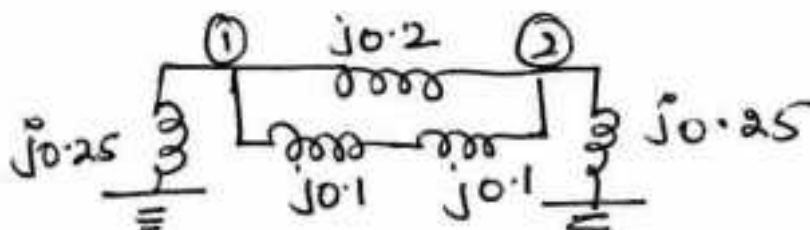
Load - 200KV, 5 = 48MW + j64MVar

Line - 200KV  $X = 120\Omega$



10

Q.3 a) Draw the bus impedance matrix for the network shown by building algorithm.



b) Drive the expression for formulation of network matrices  $Y_{bus} = A^t Y A$ . 10×2

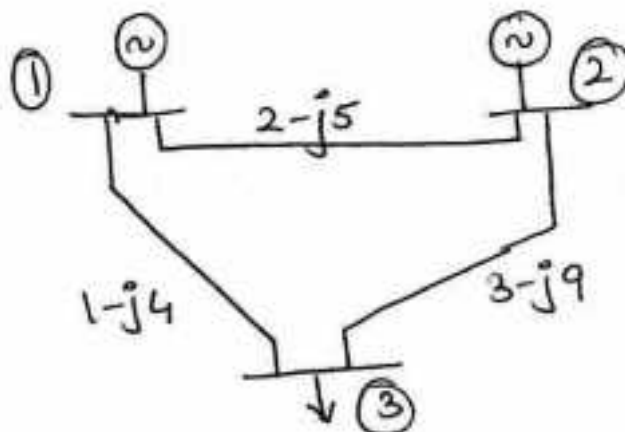
Q.4 a) The figure given below shows a power system:

Bus1 – slack bus  $E_{spec} = 1.05 \angle 0^\circ$

Bus2 – PV bus  $|E|_{spec} = 1.2 p.u$ ,  $P_G = 3 p.u$

Bus3 – PQ bus  $P_L = 4 p.u$   $Q_L = 2 p.u$

Carry out the one iteration of load flow solution by Gauss-seidel method. Take Q limits of generator 2 as  $0 \leq Q < 4$ . Take  $\alpha = 1$ .



b) Write the algorithm to explain Newton Raphson method for load flow study. 10

### PART-B

Q.5 a) Explain with mathematical equation modeling of turbine speed governing system in automatic generation control. 10

b) A 100 MVA synchronous generator operates on full load at a frequency of 50 Hz. The load is suddenly reduced by 50 MW. Due to time lag in governor system, the steam valve begins to close after 0.4s. Determine the change in frequency that occurs in this time.

Given:  $H = 5 \text{ KWS / KVA}$  of generator capacity. 10

Q.6 a) State and explain equal area criterion. Indicate how will you apply equal area criterion to find the maximum additional load that can be suddenly added load. 10

b) Describe the dynamics of synchronous machine with swing equation. 10

Q.7 Write short notes on:

a) Statcom.

b) UPFC.

c) TCSC.

d) SSSC.

5×4

**End Semester Examination, May 2017**  
**B. Tech – Sixth Semester**  
**DESIGN OF ELECTRICAL MACHINES (EE-604)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Answer the following in brief:

- a) Compare the different types of cooling media used for electrical machines.
- b) Define 'heating time constant'.
- c) Give any five limitations of electrical machine design.
- d) Why circular coils are preferred over rectangular coils for winding of transformers.
- e) Explain why a machine designed by a higher specific loading has a poor voltage regulation?
- f) Why low voltage winding is kept near core?
- g) What are the factors to select the number of poles of D.C. machine?
- h) Why in an induction motors the number of slots should never be equal to number of rotor slots?
- i) What are the types of ventilation?
- j) What type of rotor windings are preferred for small induction motors? 2 × 10

**PART-A**

- Q.2
  - a) Discuss the different ratings of electrical machines with suitable diagrams. How the temperature rise affects the selection of machine rating? 10
  - b) A field coil has a heat dissipating surface of  $0.15\text{m}^2$  and length of mean turn of 1 m. It dissipated loss of 150 W, the emissivity being  $34\text{ w/m}^2\text{-}^\circ\text{C}$ . Estimate the final steady temperature rise of the coil and its time constant if the cross section of the coil is  $100 \times 50\text{mm}^2$ . Specific heat of copper is  $390\text{ J/kg}^\circ\text{C}$ . The space factor is 0.56, copper weight  $8900\text{ kg/m}^3$ . 10
- Q.3
  - a) Calculate the m.m.f for iron parts of rotating machine. 10
  - b) Explain the overall designing of induction motor with suitable diagrams and derivations. 10
- Q.4
  - a) Explain with mathematical equations why stepped core must be preferred over rectangular or square cores. 8
  - b) Calculate the core and window areas of 400 KVA, 50Hz single phase, core type power transformer. The following data may be assumed: ratio of weight of iron to weight of copper = 4. Ratio of length of mean turn of copper to length of mean flux path = 0.5 maximum flux density =  $1.5\text{ wb/m}^2$ , current density =  $2.2\text{ A/m}^2$ , density of copper =  $8.9 \times 10^3\text{ kg/m}^3$ , density of iron =  $7.8 \times 10^3\text{ kg/m}^3$ , copper space factor = 0.12. 12

**PART-B**

- Q.5
  - a) Briefly discuss about constructional features of D.C. machine. Also obtain the output e.m.f equation of D.C. machine. 10
  - b) Find the main dimensions of 200 kW, 250 V, 6 pole and 1000 rpm generator. The maximum value of flux density in the gap is  $0.87\text{ wb/m}^2$  and the ampere conductors per meter of armature periphery are 31000. The ratio of pole arc to pole pitch is

0.67 and the efficiency is 91%. Assume the ratio of length of core to pole pitch = 0.75. 10

- Q.6 a) Describe the design of field system for synchronous machine. 15  
b) What are the factors to be considered for selection of armature slots? 5

- Q.7 How do you calculate the following for an induction motor?  
a) Area of stator slots.  
b) Length of mean turn.  
c) Stator teeth.  
d) End rings. 5 × 4

**End Semester Examination, May 2017**  
**B. Tech – Sixth Semester**  
**CONTROL ENGINEERING (EE-606)**

Time: 3 hrs.

Max Marks: 100

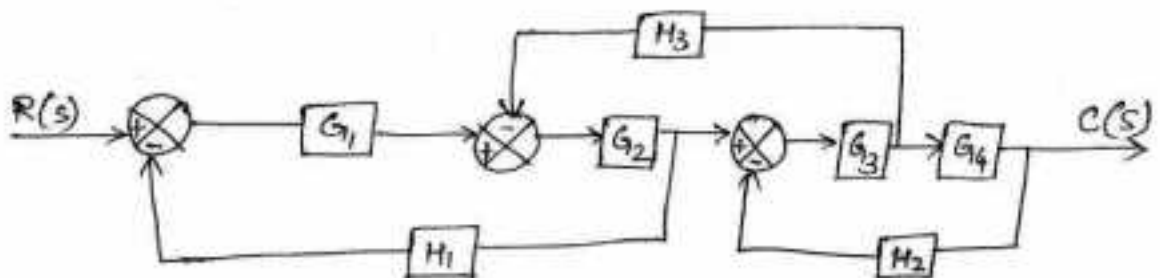
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Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.

- Q.1
- Compare open loop and closed loop systems.
  - What is the difference between type and order of a system?
  - Define 'rise time' and 'peak time' for second order system'.
  - Explain steady state error of a feedback control system.
  - What is the advantage of integral controller?
  - Define the term 'stability in reference to control system'.
  - What will be the initial slope of the Bode magnitude plot having no poles at the origin?
  - Define 'gain margin' and 'phase margin' in relation to polar plot.
  - Draw the circuit diagram of lead compensator.
  - What are synchros?
- 2 × 10

**PART-A**

- Q.2 a) Determine the closed loop transfer function  $\frac{C(S)}{R(S)}$  of the system represented by the block diagram shown below using block diagram reduction technique.



12

- b) Derive an expression for the transfer function of an armature controlled D.C. motor.
- 8

- Q.3
- Explain the specifications pertaining to transient response of a second order control system. 10
  - Determine the position, velocity and acceleration error constants of a unit feedback control system with forward path gain as  $\frac{15}{(S+2)(S^2+2S+10)}$ . Also find steady state error for unit step input. 10
- Q.4
- The characteristic equation of a closed loop control system is  $3s^4 + 10s^3 + 5s^2 + 5s + 4 = 0$ . Construct Routh array to determine the system stability. 10
  - A feedback control system has an open loop transferfunction  $G(S) H(S) = \frac{K}{S(S^2 + 4S + 8)}$ . Sketch the root locus as K is varies from 0 to  $\infty$ . 10

**PART-B**



- Q.5 a) Sketch the polar plot of transfer function  $G(S) H(S) = \frac{K}{S^2(1+ST)}$ . **10**
- b) State and explain Nyquist stability criterion. **10**
- Q.6 Write short notes on *(ANY TWO)*:
- a) Stepper motor and its applications.
- b) A.C. servo motor.
- c) Magnetic amplifier. **10×2**
- Q.7 a) Define 'lag compensation'. Draw a block diagram of electrical network for this system. **10**
- b) Write a short note on: 'PID controller'. **10**

**End Semester Examination, May 2017**  
**B. Tech.— Sixth Semester**  
**HIGH VOLTAGE ENGINEERING (EE-621A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) Explain the basic principle of electrostatic machines.
  - b) How principle of resonance is used to produce high voltage?
  - c) Write any two advantages of modified Marx circuit.
  - d) Draw the circuit of Tesla coil and its output waveform.
  - e) Name any two devices used for protection against over voltages.
  - f) Which types of surge diverter is used for over voltage protection in EHV system?
  - g) A simple partial discharge detector circuit consists of \_\_\_\_\_ and \_\_\_\_\_.
  - h) Define 'surge impedance level'.
  - i) Explain lightning phenomenon.
  - j) Name Different breakdown mechanism in solid dielectrics. 2 × 10

**PART-A**

- Q.2
- a) Write short notes on:
    - i) Resonant transformer.
    - ii) Cascaded transformer. 5 × 2
  - b) Discuss in detail the working of Cockcroft Walton voltage multiplier circuit. 10
- Q.3
- a) Define the 'impulse current waveforms'. Explain the circuit for producing impulse current waves. 10
  - b) Explain various components of multistage impulse generator. 10
- Q.4
- What is lightning arrester? Also discuss different types of lightning arrester in detail. 20

**PART-B**

- Q.5
- What is meant by insulation co-ordination? Discuss in detail how insulation level of protective device is chosen. 20
- Q.6
- a) Derive Townsend's current growth equation and also explain Townsend's criterion for breakdown. 10
  - b) Explain partial discharge measurement by using straight detectors. 10
- Q.7
- a) What are the biological aspects in UHV line design? 10
  - b) What precautions are taken for live line maintenance? Also explain the principle of live line maintenance in brief. 10

**End Semester Examination, May 2017**  
**B. Tech.— Seventh Semester**  
**COMPUTER APPLICATIONS IN POWER SYSTEMS (EE-622)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

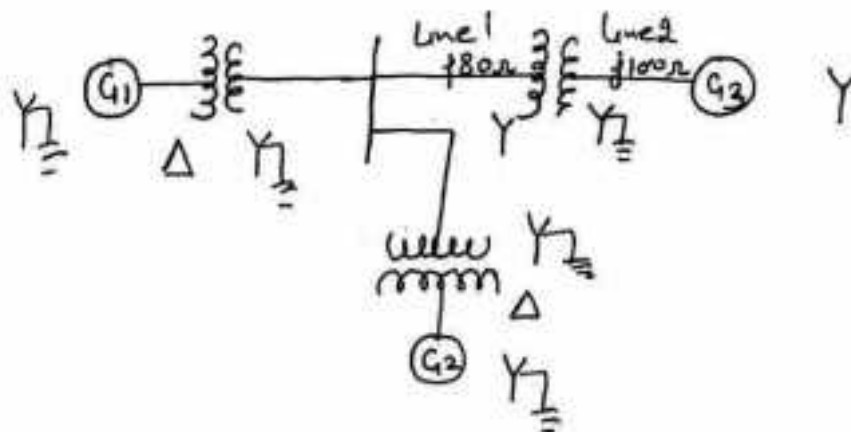
Q.1 Answer the following:

- a) Define 'power quality'.
- b) What are advantages of interconnected system?
- c) Draw the  $\pi$  – circuit model for a transformer with off nominal tap ratio  $\alpha$ .
- d) What is primitive network?
- e) What is significance of sequence operator?
- f) Why do we go for iterative methods to solve the load flow problem?
- g) How is optimal flow represented as non-linear optimization method?
- h) List the various methods to solve OPF methods.
- i) Define 'contingency'.
- j) Define per unit value of an electrical quantity. Write equation for base impedance with respect to three phase system.  $2 \times 10$

**PART-A**

- Q.2
  - a) Explain the various components and working of SCADA in detail. 10
  - b) What do you understand by load frequency control? Explain LFC of two area system in detail with help of a block diagram. 10
- Q.3
  - a) Explain the significance of positive, negative and zero sequence components. Derive an expression for symmetrical component of 5 voltage for  $3-\phi$  unbalanced system. 10
  - b) Draw the reactance diagram for the power system. Neglect the resistance and use a base of 50 MVA and 13.8 kV on generator,  $G_1$ .
 

$G_1$ : 20 MVA, 13.8 kV,  $x'' = 20\%$   
 $G_2$ : 30 MVA, 18 kV,  $x'' = 20\%$   
 $G_3$ : 30 MVA, 20 kV,  $x'' = 20\%$   
 $T_1$ : 25 MVA, 220/13.8 kV,  $x = 10\%$   
 $T_2$ : 3 single phase each unit rated 10 MVA, 127/18 kV  $x = 10\%$   
 $T_3$ : 35 MVA, 220/22 kV,  $x = 10\%$



- Q.4 a) Draw the  $Z_{bus}$  algorithm using step-by-step method. 10  
 b) Draw the  $Y_{bus}$  and  $Z_{bus}$  for the following network data given without mutual coupling.

1.	1-0	0.08
2.	2-0	0.10
3.	1-2	0.5
4.	1-3	0.4
5.	1-4	0.25
6.	3-4	0.20
7.	2-4	0.25

10

### PART-B

- Q.5 a) Derive an expression for line-to-line fault. 10  
 b) A  $3-\phi$ , 11 kV, 25 MVA generator with  $X_0 = 0.5 pu$ ,  $X_1 = 0.2 pu$  and  $X_2 = 0.2 pu$  is grounded through a reactance of  $0.3\Omega$ . Calculate the fault current for single and ground fault. 10
- Q.6 a) Write the algorithm for Newton Raphson method. 10  
 b) The system data for a load flow solution are given in table 6.2 and 6.3. Determine the voltages at end of first iteration using Gauss-Seidal method.

Table 6.2:		Table 6.3				
Bus Code.	Admittance	Bus Code	$P_{inpu}$	$Q_{inpu}$	$V_{inpu}$	Remarks
1-2	$2-j8$	1	—	—	1.06	Slack
1-0	$1-j4$	2	0.5	0.2	$1+j0.0$	PQ
2-3	$0.666-j2.664$	3	0.4	0.3	$1+j0.0$	PQ
2-4	$1-j4$	4	0.3	0.1	$1+j0.0$	PQ
3-4	$2-j8$					

10

- Q.7 a) Explain optimal generation without transmission losses. 10  
 b) The fuel cost function in Rs/hr for two thermal plants are given by:  
 $C_1 = 450 + 8.2P_1 + .006P_1^2$        $100 \leq P_1 \leq 600$   
 $C_2 = 600 + 6.78P_2 + .004P_2^2$        $60 \leq P_2 \leq 300$   
 Determine optimal scheduling of generation for following loads:  
 i)  $P_D = 550 MW$   
 ii)  $P_D = 870 MW$  10

**End Semester Examination, May 2017**  
**B. Tech.— Sixth Semester**  
**NEW AND RENEWABLE ENERGY SOURCES (EE-625A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) Define 'solar insolation'.
  - b) What do you mean by photovoltaic effect?
  - c) Explain greenhouse effect.
  - d) Define 'energy farming'.
  - e) What are the various materials used in manufacturing of solar cell?
  - f) Discuss in brief the characteristics of wind.
  - g) Define 'hydrogen energy'.
  - h) Draw the diagram of solar cooker.
  - i) What do you mean by 'mini and small hydro projects'?
  - j) Discuss the various types of heat exchangers. 2 × 10

**PART-A**

- Q.2
- a) Discuss the performance analysis of flat-plate collector in details. 10
  - b) What do you mean by conventional sources of energy production? Discuss the various sources in brief. 10
- Q.3
- a) Discuss horizontal axis and vertical axis wind turbines in detail. 10
  - b) Draw and explain the block diagram for 'Wind energy conversion system'? 10
- Q.4
- a) Write the empirical equations as given by Angstrom for predicting the availability of solar radiation. 10
  - b) Explain different types of photovoltaic system with proper diagram. 10

**PART-B**

- Q.5
- a) Explain the process of power generation using tidal power. 10
  - b) Explain the principle of operation and open cycle method of power generation of OTEC. 10
- Q.6
- a) What is anaerobic digestion system of biogas? Explain briefly along with its benefits. 10
  - b) Explain micro and mini hydro projects. 10
- Q.7
- a) Define 'nuclear fusion' in detail and then compare it with nuclear fission. 10
  - b) Explain the operation of fuel cell. Also, list some applications. 10

**Note:** Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

**Q.1 Answer the following in brief:**

- Define the term: 'energy audit'.
- List down the objectives of supply side management.
- What is the need for energy conservation?
- Explain the terms 'maximum demand and diversity factor'.
- Explain DEFENDUS strategy.
- Define 'coefficient of performance'.
- What do you understand by compensator in heating?
- Differentiate between 'base load' and 'peak load'.
- What is least cost power planning?
- Explain the instruments water flow meter and infrared thermometer.

**PART-A**

- Q.2 a) Explain the terms: i) Energy intensity. 6  
ii) Energy management. 6  
b) Draw and explain the organization chart for both non energy and energy intensive organization. 14
- Q.3 a) Discuss the types and significance of energy audit in detail. 8  
b) During the course of energy audit, the data collected regarding the consumption of LPG and electricity is as follows:  
i) Average consumption of LPG cylinders per month = 25  
ii) Power consumption of boiler = 3 kW  
iii) Power consumption of geysers = 10 kW  
Average running hours of boilers and geysers is 10 hrs/day.  
Number of months for the above consumption is 9 months. It is proposed by energy auditors to replace the same with solar water heaters. 100 liters of solar water heater can save 1000 kWh of electricity per year as well as 200 kgs LPG per year.  
I) Estimate LPG consumption in kg.  
II) Estimate number of 100 liters capacity solar water systems to replace LPG cylinders, geysers and boilers.  
III) Evaluate monetary savings and payback period. Assume cost of each solar water heater ` 20,000/- and cost of electricity is ` 8/ kWh. Take each cylinder containing 14 kgs of LPG to cost about ` 350/-.

- |     |  |    |
|-----|--|----|
| Q.4 | a) Discuss the laws of thermodynamics in detail.                     | 10 |
|     | b) Discuss refrigeration in detail with the help of a block diagram. | 10 |

***PART-B***

- |     |   |    |
|-----|---|----|
| Q.5 | a) What do you understand by load factor and diversity factor? Explain in detail. | 10 |
|     | b) How is energy management related to electric drives?                           | 10 |

- Q.6 a) What do you mean by life cycle costing? Discuss the various factors to be considered for life cycle costing. 11
- b) Explain the terms:
- i) Average rate of return.
  - ii) Internal rate of return.
  - iii) Present value method. 3 × 3
- Q.7 a) Write a short note on 'cogeneration technologies'. 6
- b) Discuss the types of cogeneration cycles in detail. 14

**End Semester Examination, May 2017**  
**B. Tech.– Seventh/ Eighth Semester**  
**ADVANCED CONTROL SYSTEM (EE-801)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Attempt all the following questions:

- a) Define the terms:
  - i) State space.
  - ii) State variable.
- b) What is controllability of a system?
- c) List two properties of state transition matrix.
- d) Explain the term region of convergence (ROC).
- e) Explain singular points for a system.
- f) Define 'limit cycle'.
- g) Explain asymptotic stability.
- h) Define 'transfer function'.
- i) What is zero order hold circuit?
- j) Find z-transform of:
  - i)  $x_1(n) = (1, 2, 4, 5, 7, 0, 1)$
  - ii) Unit step response.

2 × 10

**PART-A**

Q.2 a) A state space representation of a system is given as:

$$x = Ax + Bu \text{ and } y = cx$$

Where  $A = \begin{bmatrix} 0 & 1 & 0 \\ 3 & 0 & 2 \\ -12 & -7 & -6 \end{bmatrix}$ ,  $B = \begin{bmatrix} 1 \\ 0 \\ 2 \end{bmatrix}$  and  $C = [1 \ 0 \ 0]$  obtain eigen vectors, eigen

values and a new state space representation so that the state matrix becomes diagonal matrix. 15

b) What are the advantages of state space technique? 5

Q.3 a) Define 'observability of a system'. State the conditions of observability in terms of matrices A and C. 10

b) Check whether the following system is controllable and observable.

$$x = \begin{bmatrix} -3 & 1 & 1 \\ -1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix} x + \begin{bmatrix} 0 & 1 \\ 0 & 0 \\ 2 & 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix} x$$

10

Q.4 a) Draw and explain ROC for infinite duration sequence for various types of signals. 10

b) Find inverse z transform of:

i)  $X(z) = 3 + 4z^{-1} + 6z^{-3}$

ii)  $\frac{1 + z^{-1}}{1 - z^{-1} + 0.5z^{-2}}$

10



**PART-B**

- Q.5 a) Check the stability of the system characterized by the equation below using Jury's test:  
 $z^3 - 1.3z^2 - 0.08z + 0.24 = 0$  12
- b) Explain data reconstruction and hold circuits. 8
- Q.6 a) Define a nonlinear system. What are inherent nonlinearities? Discuss saturation in a system. 10
- b) Derive an expression for describing function for an ideal relay. 10
- Q.7 a) Explain concept of variable structure controller. 10
- b) Discuss Lyapunov's stability criterion with a suitable example. 10

**End Semester Examination, May 2017**  
**B. Tech.— Seventh Semester**  
**UTILIZATION OF ELECTRIC POWER AND TRACTION (EE-821)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

Q.1 Answer the following:

- a) What are the properties to be considered for selecting material for heating element?
- b) What are the causes of failure of heating element?
- c) What are the qualities of good weld?
- d) \_\_\_\_\_ type of dc generator is used for electric arc welding.
- e) Mention properties of good illumination.
- f) Differentiate between 'lamp efficiency' and 'specific consumption'.
- g) What is relation between chemical equivalent, atomic weight and valency of any substance?
- h) Write the applications of electrolysis processes.
- i) Why thermostat is used in domestic refrigerator?
- j) Why single phase system is preferred for main line railway service? 2 × 10

**PART-A**

- Q.2 a) Explain construction and working of a fluorescent tube with help of circuit giving the function of various parts. How is stroboscopic effect eliminated in fluorescent tube lighting? 10
- b) A minimum illumination of 80 lumen/m<sup>2</sup> is required in a factory shed of 100m × 10m. Calculate the number, location and wattage of the units to be used. Assume that the depreciation factor is 0.89, coefficient of utilization is 0.4 and efficiency of the lamp is 40 lumens/watt. 10
- Q.3 a) Discuss various methods of electric heating and explain one of them with its field of application. 10
- b) A 2.5 kW, 240 V, single-phase resistance oven is to have nichrome wire heating elements. If the wire temperature is to be 1500°C and that of the charge 450°C, estimate the diameter and length of wire. The resistivity of the nichrome alloy is 42.5 μΩ-cm. Assume the radiating efficiency and the emissivity of the element as 1.0 and 0.9 respectively. 10
- Q.4 Explain the various types of resistance and arc welding. How the mechanical pressure, amount of current and its duration is controlled in case of resistance welding? 20

**PART-B**

- Q.5 a) Discuss various laws of electrolysis. What are different applications of electrolysis? 10
- b) Find the thickness of copper deposited on a plate area of 0.00025m<sup>2</sup> during electrolysis, if a current of 1.5 A is passed for one hour. Density of copper is 8900 kg / m<sup>3</sup> and ECE of copper = 32.95 × 10<sup>-8</sup> kg / C. 10
- Q.6 a) What are the different systems of railway electrification? 10
- b) Explain the characteristics of motors required for construction of locomotive. 10
- Q.7 a) Explain the working principle of thermoelectric refrigeration system. List out the merits and demerits of thermoelectric refrigeration system over other refrigeration. 10

- b) What is air conditioning? How is air from microorganism, gaseous contaminants and odors purified? 10

**End Semester Examination, May 2017**  
**M. Tech.— First Semester**  
**COMPUTER AIDED POWER SYSTEM ANALYSIS (EE-M-104)**

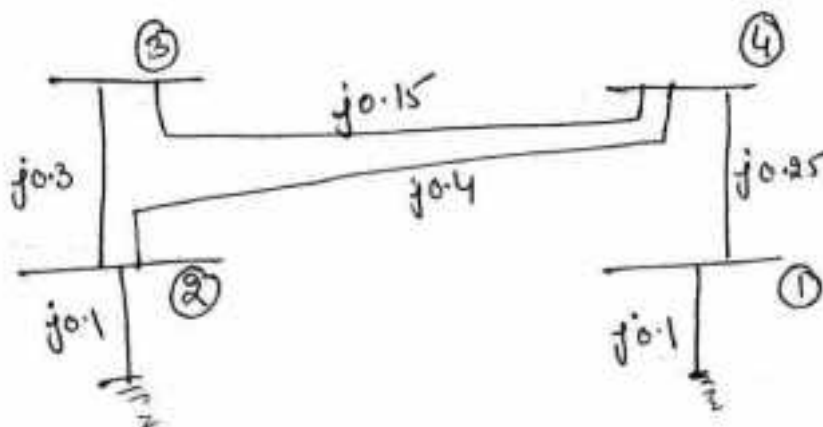
Time: 3 hrs.

Max Marks: 75

No. of pages: 1

Note: Attempt ANY FIVE questions in all. Each question carries equal marks.

- Q.1 Give a flow chart for load flow study on a power system having only P-Q buses using Gauss-Seidel method. How does the flow chart get modified to account for PV buses? 15
- Q.2 a) The line current in amperes in phases a, b and c respectively are  $500+j150$ ,  $100-j600$  and  $-300+j600$  referred to sense reference vector. Find the symmetrical components of currents. 7  
 b) Discuss step by step formulation of  $Y_{BUS}$ . 8
- Q.3 What are different kinds of faults in power system? Derive the expression for fault current in SLG fault. 15
- Q.4 The single line diagram of power system is shown in the figure formula at  $Z_{BUS}$  matrix. 15



- Q.5 Explain per unit system of analyzing power system problems. Discuss the advantages of per unit system over the absolute method of analysis in detail. 15
- Q.6 a) Discuss the various factors affecting security of power system in detail.  
 b) Explain network sensitivity using load flow.  $7\frac{1}{2} \times 2$
- Q.7 Write short notes on (ANY TWO):  
 i) Contingency analysis.  
 ii) Network observability and pseudo measurement.  
 iii) State estimation of A.C. network.  $7\frac{1}{2} \times 2$
- Q.8 Explain the representation of synchronous machine, transmission line and 3-d transformer in power system analysis. 15

**End Semester Examination, May 2017**  
**M.Tech. (P.S.E.D) -Second Semester**  
**OPTIMAL POWER SYSTEM OPERATION (EE-M-201)**

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

- Q.1 a) Explain Newton's method of economic dispatch problem. 8  
 b) Discuss the base point and participation factors method of economic load dispatch. 7
- Q.2 a) What is unit commitment? Discuss the constraints in unit commitment. 8  
 b) Using the DP method, how do you find the most economical combination of the units to meet a particular load demand? 7
- Q.3 a) Explain in detail, the long range and short range hydro scheduling. 8  
 b) A hydroplant and a steam plant supply a constant of 90W for one week. The unit characteristics are  
 Hydroplant:  $q = 300 + 15P_H \text{ acre-ft/h}; 0 \leq P_H \leq 100\text{MW}$   
 Steam Plant:  $H_S = 53.25 + 11.27P_S + 0.0213P_S^2; 12:25 \leq P_S \leq 50\text{MW}$   
 If the hydroplant is limited to 10GWH of energy, find the runtime of the steam unit TS. 7
- Q.4 a) Explain the gradient approach hydrothermal scheduling. 7  
 b) Explain the flow diagram of security contained OPF. 8
- Q.5 a) The incremental fuel cost for two units system is given below:  
 $\partial F_1 / \partial P_1 = 0.25P_1 + 35 \text{ Rs/hr}$   
 $\partial F_2 / \partial P_2 = 0.50P_2 + 40 \text{ Rs/hr}$   
 Develop the load sharing pattern for full load curve and prove that there is a saving when we load the system by coordination instead of sharing by equal ratio for a particular case of 200 MW loading. 10  
 b) Explain the merits and demerits of centralized economic dispatch. 5
- Q.6 a) Develop the mathematical model for AGC of two area system using state space modeling. 8  
 b) Explain the generation rate constraints for thermal units, what will be its impact on AGC? 7
- Q.7 a) Explain the power pool concept in economic dispatch. 5  
 b) Write short notes on:  
 i) Capacity interchange.  
 ii) Diversity interchange.  
 iii) Energy banking. 10
- Q.8 a) Explain the power flow through a transmission link and prove that:  

$$P_R = \frac{|V_R||V_S|}{|x|} \sin \delta, \quad Q_R = \frac{|V_S||V_R|}{|x|} \cos \delta - \frac{|V_R|^2}{|x|}$$
  
 Where symbols have their usual meaning. 8  
 b) Discuss the general mechanism of coordinating load frequency control and economic dispatch. 7

**End Semester Examination, May 2017**  
**M. Tech.— Second Semester**  
**INTELLIGENT TECHNIQUES AND APPLICATIONS (EE-M-202)**

Time: 3 hrs.

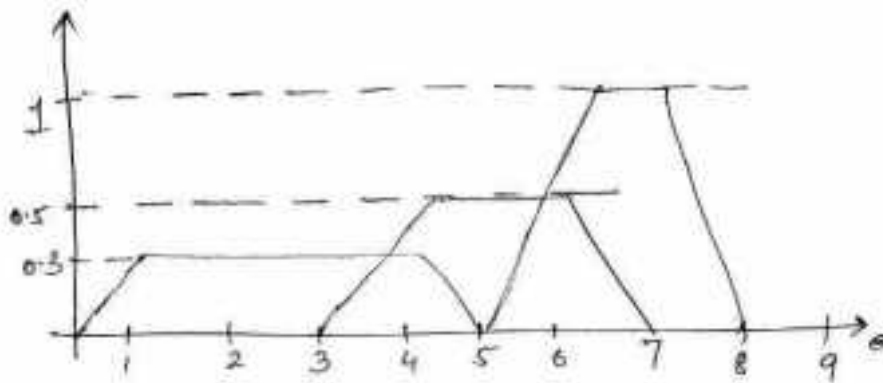
Max Marks: 75

No. of pages: 1

Note: Attempt ANY FIVE questions in all. Each question carries equal marks.

- Q.1 a) Describe the Hill climbing search techniques. What are the problems associated with it? 7  
 b) Write the following in predicate logic:  
 i) All rabbits are white.  
 ii) All that glitters is not gold.  
 iii) No rabbit is white.  
 iv) Neha is a good player. 2 × 4

- Q.2 List and explain various defuzzification methods. Also find crisp output from the following three membership function using centroid method.



15

- Q.3 a) What are linguistic variables in a fuzzy system? 7  
 b) What are the various membership functions to describe fuzzy sets? 8
- Q.4 a) What do you understand by evolutionary techniques? Draw and explain a feedback neural network. 10  
 b) Explain RBF network in brief. 5
- Q.5 a) Draw a flowchart of the simple genetic algorithm and explain the steps involved in it. 10  
 b) How is the selection done in GA? 5
- Q.6 What is difference between neuro-genetic and neuro-fuzzy system? Explain neuro-fuzzy system in detail. 15
- Q.7 Explain how AI can be incorporated in load flow and load forecasting. 15
- Q.8 Write short notes on (ANY TWO):  
 a) Fitness function.  
 b) Cross over.  
 c) Multivalued logic. 7½ × 2

**End Semester Examination, May 2017**  
**M. Tech. (P.S.E.D)–SecondSemester**  
**POWER QUALITY AND FACTS DEVICES (EE-M-203)**

Time: 3 hrs.

Max Marks:75

No. of pages:1

Note: *Attempt anyFIVE questions in all. Each question carries equal marks.*

- |     |   |                   |
|-----|---|-------------------|
| Q.1 | a) Discuss various power quality issues along with their causes and effects.<br>b) What are the various transmission problems and needs?            | 10<br>5           |
| Q.2 | a) What are the effects of Harmonics on power system equipment and condition?<br>b) What are the various Harmonic mitigation methods? Compare them. | 8<br>7            |
| Q.3 | Explain the working of the following:<br>a) Harmonic analyzer.<br>b) Transient disturbance analyzer.<br>c) True RMS meter.                          | <br><br><br>5 × 3 |
| Q.4 | a) Differentiate between voltage sag and voltage swell.<br>b) Explain fourier transform with an example.  | 7<br>8            |
| Q.5 | a) Explain how STATCOM control the flow of active and reactive power independently?<br>b) Explain the principle of operation and modelling of SSSC. | 7<br>8            |
| Q.6 | Explain the basic operating principle of UPFC. Discuss its various applications in detail.  | 15                |
| Q.7 | a) What is the need of compensation? Discuss the advantages of series compensators.<br>b) Explain transients in detail.                             | 10<br>5           |
| Q.8 | a) Why do we need a transformation? Explain wavelet transform in details.<br>b) Define the terms: SAIDI, CAIDI.                                     | 10<br>5           |

**End Semester Examination, May 2017**  
**M.Tech. (P.S.E.D) -Second Semester**  
**POWER CONDITIONING (EE-M-205)**

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: *Attempt any FIVE questions in all. Each question carries equal marks.*

- |     |  |     |
|-----|--|-----|
| Q.1 | a) Explain the concept of power conditioning in detail.  | 7   |
|     | b) What is unity power factor rectifier?   | 8   |
| Q.2 | a) Differentiate between 'voltage sag' and 'voltage swell'. How do they effect the performance of a supply system?   | 10  |
|     | b) What are the causes of voltage sag and voltage swell?   | 5   |
| Q.3 | Describe switched mode regulators with proper circuit diagram and wavefarm. Analyse Buck Regulator. Also enumerate the advantages and disadvantages of Buck Converter. | 15  |
| Q.4 | a) What is the basic concept of multilevel inverters and how we can classify them?   | 5   |
|     | b) Explain the operation of five level diode clamped multilevel inverter. What are the features of diode clamped inverter?   | 10  |
| Q.5 | a) Explain the working of UPS on line and off line.  | 7   |
|     | b) Develop the state space model of DC – DC convertor.   | 8   |
| Q.6 | a) Describe the working of active filter for harmonic and reactive power compensation.   | 10  |
|     | b) Differentiate between series and shunt compensation.  | 5   |
| Q.7 | a) What are the various types of switched mode DC power supply? Discuss the working of flyback converter with appropriate wavefarm and circuit diagram.                | 10  |
|     | b) Explain how the monitoring of power quality can be done.  | 5   |
| Q.8 | Write short notes on ( <i>any three</i> ):   |     |
|     | a) High frequency induction heating.   |     |
|     | b) Cuk regulator.  |     |
|     | c) Fuzzy logic control.  |     |
|     | d) Power supplies in telecommunication and automobiles.  | 5x3 |



**End Semester Examination, May 2017**  
**M. Tech.— Second Semester**  
**RENEWABLE POWER GENERATION SOURCES (EE-M-227)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 1

Note: *Attempt ANY FIVE questions in all. Each question carries equal marks.*

- Q.1 Explain different types of photovoltaic system using block diagram. Also explain solar photovoltaic energy conversion system principle. 15
- Q.2 Write short notes on:  
 a) MPPT.  
 b) Limitations of SPV systems.  
 c) Building integrated photovoltaics. 5x3
- Q.3 a) Draw VI characteristics of PV Cell and show the MPPT point on it. 8  
 b) What is photovoltaic cell or module? 7
- Q.4 Explain the momentum theory of wind power generation. Give the classification of rotor used for wind generation. 15
- Q.5 a) Derive the expression for power developed due to wind. 5  
 b) The following data relate to propeller turbine:  
 Velocity of wind at 20°C = 20 m/s (at atmospheric pressure)  
 Operating speed of the turbine = 45 r.p.m. at maximum efficiency.  
 Turbine diameter = 12 m.  
Calculate:  
 i) Total power density in the wind system.  
 ii) Maximum obtainable power density.  
 iii) Reasonably obtainable power density.  
 iv) Total power generated.  
 v) Maximum torque and maximum axial thrust. 10
- Q.6 a) Define the following terms:  
 i) Angle of attack.  
 ii) Pitch angle.  
 iii) Nacelle.  
 iv) Cut-in-speed. 1x4  
 b) Explain the principle of combined wind/diesel power generation. 11
- Q.7 Explain briefly the following:  
 a) Constant speed-constant frequency (CSCF) system.  
 b) Variable speed-constant frequency (VSCF) system. 7½ x 2
- Q.8 Explain the principle of open cycle OTEC system with suitable diagram. State the limitation of OTEC system. 15

**End Semester Examination, May 2017**  
**B. Tech.– First Semester**  
**PROFESSIONAL COMMUNICATION-I (HM-104)**

Time: 2 hrs.

Max Marks: 50

No. of pages: 2

Note: *Attempt FIVE questions in all; Q. 1 is compulsory. Attempt ANY TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

**Q.1** Convert the following sentences in the correct tense as stated against each sentence (*ANY TEN*):

- a) Aditya(finish) his homework. (*Simple Past*)
- b) John (work) the entire day. (*Present Perfect*)
- c) She always(tell) us funny stories. (*Simple Past*)
- d) He (help) me with that! (*Future*)
- e) Martha and Kevin (swim) twice a week. (*Future Continuous*)
- f) Sonia (cook) dinner for two hours. (*Past Perfect Continuous*)
- g) You (play) baseball. (*Present Perfect Continuous*)
- h) Samantha (work) every day. (*Simple Present*)
- i) You (do) nothing for the last 30 minutes. (*Present Perfect Continuous*)
- j) I usually (go) to school. (*Simple Present*)
- k) I (have) a pizza. (*Future*)
- l) In this club people usually (dance) a lot. (*Simple Present*)
- m) Om (sing) tonight. (*Future*)

1 × 10

**PART-A**

**Q.2** a) Bring out the difference of the meanings of the following words given in the pairs by using them in sentences. (*ANY FIVE*):

- a) There- Their
- b) Whether-weather
- c) Around-Round
- d) Effect-Affect
- e) Except- Accept
- f) Aloud –Allowed

1 × 5

b) Identify the underlined words as Parts of Speech (*ANY FIVE*):

- a) Radha helped him carry it.
- b) The ice cream was very cold.
- c) My father said, "Oh! What a sad end!"
- d) We didn't spend the night there.
- e) They got back home late at night but we didn't go to sleep immediately.
- f) Vishnu is an amazing actor.

1 × 5

**Q.3** Write a paragraph of approximately 150 words on the topic "Impact of demonetization on Economy". 10

**Q.4** "India will be a powerhouse in 2025". Write a debate in favor or against this statement in 100 words. 10

**PART-B**

**Q.5** Read the following passage carefully:

The Alchemist is an easy story with a deep message. It is a message to follow your heart and search for your dreams. The book is about a young man named Santiago who lives in Spain and works as a shepherd. He begins to have strange dreams so he goes to a Gypsy to find out what they mean. The Gypsy tells him that he needs to go to the Egyptian pyramids to find his treasure. Of course he does not believe her. But later he meets another person who tells him the same thing. At last Santiago decides to give

up his life as a shepherd and go find his treasure.

Santiago encounters many problems as he goes on his journey. He meets many people and learns a lot along the way. He also learns to listen to and trust the Soul of the World. Does he ever find his treasure? And why is the book called *The Alchemist*? I can't tell you. You will have to read the book if you want to find out.

The *Alchemist* was originally written in Portuguese by Paulo Coelho, a Brazilian author. It has been translated into many languages, including, of course, English. It is a good book for people who are learning English because most of the sentences are fairly short and you will recognize a lot of the vocabulary. There are definitely words you will not know at first, but with a little patience and study you should be able to finish (and maybe enjoy) the book. And hopefully you will be able to follow your dreams as well.

Now answer the following questions based on the above passage as **TRUE OR FALSE**:

- a) The *Alchemist* is a book about following your dreams.
- b) A Gypsy is from Egypt.
- c) The author of the book is from Brazil.
- d) The author wrote the book in English.
- e) Give two synonyms for the word encounter.

2×5

Q.6 Write a letter to the competent authority to allow you shift from your hostel room to another room in university hostel accommodation. Give suitable reasons for your request. 10

Q.7 Write a conversation between a news reader and the location reporter on "Earthquake in Brazil" (12 dialogues each). 10

**End Semester Examination, May 2017**  
**B. Tech.– Second Semester**  
**PROFESSIONAL COMMUNICATION-II (HM-204)**

Time: 2 hrs.

Max Marks: 50

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANY TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

**Q.1** Answer the following questions (*ANY FIVE*):

- a) Define audience analysis with respect to presentation skills.
- b) What is netiquette?
- c) Explain with examples the definition of jargon?
- d) Define 'brevity with respect to technical writing'.
- e) Define 'high context culture' with examples.
- f) What are minimal pairs?

2 × 5

**PART-A**

**Q.2** Define 'technical writing'. Discuss the essentials for good technical writing. 10

**Q.3** a) Draw the labeled format for cover letter.

b) Write down the Dos and Don'ts of E-mail writing.

5 × 2

**Q.4** a) Define 'Phonetics'. How many different sounds exist in English language? 3

b) Define 'Syllable' with two examples each please explain mono, di & poly syllabic words. 5

c) What is syllable stress? 2

**PART-B**

**Q.5** Draft an email in proper format to Ms. DivyaBhatnagar, HR Manager, ABC Ltd to apply for the position of Research Intern in their research lab in Gurugram. This position was advertised in Naukri.com on April 3,2017. Assume other details. 10

**Q.6** Elaborate on the 7C's of communication in detail. 10

**Q.7** Define 'intercultural communication'. What are the blocks to inter-culture communication? 10

**End Semester Examination, May 2017**  
**B. Tech. – Third Semester**  
**CAREER SKILLS-I (HM-302)**

Time: 2 hrs.

Max Marks: 50

No. of pages: 4

**Note:** *The paper consists of FIFTY multiple choice questions. Each question has FOUR options with ONE correct answer. Select the correct answer. Attempt all questions. All questions are of ONE mark each. There is no negative marking. Answers written in the answer table will only be considered.*

01.	02.	03.	04.	05.	06.	07.	08.	09.	10.
11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
31.	32.	33.	34.	35.	36.	37.	38.	39.	40.
41.	42.	43.	44.	45.	46.	47.	48.	49.	50.

- Q.1 Kunal walks 10 km towards North. From there he walks 6 Km towards South. Then, he walks 3 Km. towards east. How far and in which direction is he with reference to his starting point?
- 5 KM. North
  - 5 KM. South
  - 5 KM. East
  - 5KM North-East
- Q.2 What number should come next? 15, 31, 63, 127, 255,
- 511
  - 513
  - 523
  - 517
- Q.3 In a family there are husband, wife, two sons and two daughters. All the ladies were invited to adinner. Both sons went outto play. Husband did not return from office. Who was at home?
- Only wife was at home
  - All ladies were at home
  - Only sons were at home
  - No body was at home
- Q.4 Look at this series: 58, 52, 46, 40, 34, \_\_\_\_\_. What number should come next?
- 26
  - 28
  - 30
  - 32
- Q.5 A and B are young ones of C. If C is the father of A but B is not the son of C. How are B and C related?
- Niece and Uncle
  - Niece and Uncle
  - Daughter and Father
  - Daughter and Mother
- Q.6 In a certain code, RIPPLE is written as 613382 and LIFE is written as 8192. How is PILLER written in that code?
- 3188266
  - 318286
  - 618826
  - 328816
- Q.7 Today is Monday. After 61 days, it will be:
- Tuesday
  - Monday
  - Sunday
  - Saturday
- Q.8 At what time between 7 and 8 o'clock will the hands of a clock be in the same straight line but,nottogether?
- $(5 + \frac{5}{11})$  min past 7
  - $(6 + \frac{5}{11})$  min past 7
  - 7
  - 8
- Q.9 A man on tour travels first 160 km. at 64 km/hr and the next 160 kmat 80 km/hr. The average speed for the first 320 km of the tour is:
- 35.55 km/hr.
  - 36 km/hr.
  - 71.11 km/hr.
  - 71 km/hr.

- Q.10 If two numbers are in the ratio 2:3. If 10 is added to both of the numbers then, the ratio becomes 5:7 then find the largest number?  
 a) 30                                      c) 10  
 b) 40                                      d) 60
- Q.11 There is a pack of 52 cards and Rohan draws two cards together, what is the probability that one is spade and one is heart?  
 a)  $11/102$                                   b)  $13/102$   
 c)  $11/104$                                   d)  $13/104$
- Q.12 CMM, EOO, GQQ, \_\_\_\_\_, KUU:  
 a) GRR                                      b) ISS  
 c) ITT                                        d) GSS
- Q.13 In a rectangular plot, a cow is tied down at a corner with a rope of 14m long. Find the area that cow can graze?  
 a)  $154 \text{ m}^2$                                   b)  $208 \text{ m}^2$   
 c)  $158 \text{ m}^2$                                   d)  $172 \text{ m}^2$
- Q.14 Ayesha's father was 38 years of age when she was born while her mother was 36 years old when her brother four years younger to her was born. What is the difference between the ages of her parents?  
 a) 2 years                                      b) 4 years  
 c) 6 years                                      d) 8 years
- Q.15 The average height of 30 girls out of a class of 40 is 160 cms, and that of the remaining girls is 156cms. The average height of the whole class is:  
 a) 158    b) 158.5  
 c) 159    d) 159.5
- Q.16 The average of 25 results is 18; that of first twelve is 14 and that of last twelve is 17. Thirteenth result is:  
 a) 28    b) 72  
 c) 78    d) 85
- Q.17 Two students appeared at an examination. One of them secured 9 marks more than the other and his marks was 56% of the sum of their marks. What are the marks obtained by them?  
 a) 42, 33                                      b) 44, 36  
 c) 43, 36                                      d) 42, 36
- Q.18 In a queue, Amrita is 10th from the front while Mukul is 25th from behind and Mamta is just in the middle of the two. If there be 50 persons in the queue, what position does Mamta occupy from the front?  
 a) 20<sup>th</sup>    b) 19<sup>th</sup>  
 c) 18<sup>th</sup>    d) 17<sup>th</sup>
- Q.19 In an election between two candidates first candidate got 60% of votes polled and second candidate got 280 votes. The total number of votes polled was?  
 a) 700 votes                                      b) 750 votes  
 c) 600 votes                                      d) 650 votes

- Q.20 After the typist writes 12 letters and addresses 12 envelopes, she inserts the letters randomly into the envelopes (1 letter per envelope). What is the probability that exactly 1 letter is inserted in an improper envelope?
- a)  $1/12$                       b) 0  
c)  $12/212$                     d)  $11/12$
- Q.21 In a group, there were 115 people whose proofs of identity were being verified. Some had passport, some had voter id and some had both. If 65 had passport and 30 had both, how many had voter id only and not passport?
- a) 30                              b) 50  
c) 80                              d) None of these
- Q.22 In how many ways can a group of 5 men and 2 women be made out of a total of 7 men and 3 women?
- a) 1                                b) 126  
c) 63                              d) 64
- Q.23 A certain sum of money at simple interest amounted ₹840 in 10 years at 3% per annum, find the sum?
- a) 500                            b) 515  
c) 525                            d) None
- Q.24 If  $P + Q$  means P is the brother of Q;  $P \times Q$  means P is the father of Q and  $P - Q$  means P is the sister of Q, which of the following relations shows that I is the niece of K?
- a)  $K + Y + Z - I$     b)  $K + Y \times I - Z$     c)  $Z - I \times Y + K$     d)  $K \times Y + I - Z$
- Q.25 What smallest number should be added to 4456 so that the sum is completely divisible by 6?
- a) 4                                b) 3  
c) 2                                d) 1
- Q.26 A boy multiplied 987 by a certain number and obtained 559981 as his answer. If in the answer both 9 are wrong and the other digits are correct, then the correct answer would be:
- a) 553681                      b) 555181  
c) 555681                      d) 556581
- Q.27 A number was divided successively in order by 4, 5 and 6. The remainders were respectively 2, 3 and 4. The number is:
- a) 214                            b) 476  
c) 954                            d) 1908
- Q.28 The age of father 10 years ago was thrice the age of his son. Ten years hence, father's age will be twice that of his son. The ratio of their present ages is:
- a) 5:2                            b) 7:3  
c) 9:2                            d) 13:4
- Q.29 Count the number of parallelogram in the given figure:
- a) 8                                b) 11  
c) 12                              d) 15



- Q.30 If  $\log 2 = 0.30103$ , the number of digits in  $2^{64}$  is:  
 a) 18                                      b) 19  
 c) 20                                      d) 21
- Q.31 Here are some words translated from an artificial language. Dionot means oak tree, blyonot means oak leaf, blycrin means maple leaf. Which word could mean "maple syrup"?  
 a) blymuth                                b) hupponot  
 c) patricrin                                d) crinweel
- Q.32 What will be the cost of building a fence around a square plot with area equal to 289 sqft, if the price per foot of building the fence is ₹58?  
 a) ₹3944                                    b) ₹3828  
 c) ₹4176                                    d) None of these
- Q.33 A cone and a hemisphere have equal base diameters and equal volumes. The ratio of their heights is:  
 a) 2:1                                        b) 1:2  
 c) 1:3                                        d) 3:1
- Q.34 If 6th March, 2005 is Monday, what was the day of the week on 6th March, 2004?  
 a) Sunday                                  b) Saturday                                  c) Tuesday                                  d) Wednesday
- Q.35 There is a square of side 6cm. A circle is inscribed inside the square. Find the ratio of the area of circle to square:  
 a) 11/14                                      b) 66/14  
 c) 14/11                                      d) 14/66
- Q.36 Dilip's position from the left in a row of students is 10<sup>th</sup> and Jagdish's position is 20<sup>th</sup> from the right. Both of them interchange their positions and Jagdish becomes 23<sup>rd</sup> from the right. How many students are there in the row?  
 a) 33    b) 44  
 c) 42    d) None of these
- Q.37 Five boys participated in a competition. Rohit was ranked lower than Sanjay. Vikas was ranked higher than Dinesh. Kamal's rank was between Rohit and Vikas. Who was ranked highest?  
 a) Sanjay                                    b) Vikas  
 c) Dinesh                                    d) Kamal  
 e) None of these
- Q.38 How many 2-digit distinct nos. can be formed from digits 1, 2, 3, 4, 5, 6?  
 a) 30    b) 36  
 c) 35    d) None of these
- Q.39 Introducing a woman, Nisha said, 'She is the daughter-in-law of the grandmother of my father's only son.' How is the woman related to Nisha?  
 a) Grandmother                            b) Sister-in-law                            c) Sister                                      d) Mother
- Q.40 The sides of a triangle are in the ratio of  $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$ . If the perimeter is 52cm. then the length of the smallest side is:  
 a) 9 cm.                                      b) 10 cm.

- c) 11 cm.                      d) 12 cm.

- Q.41 In what time will a railway train 60 m long moving at the rate of 36 kmph pass a telegraph post on its way?  
 a) 9 sec                      b) 8 sec  
 b) 7 sec                      d) 6 sec
- Q.42 At the birthday party Sherry, 40% chose to give him clothes as gift and 25% choose to shake hands with him. 10% choose to both gift him and shake hands with him. How many persons turned out at the party?  
 a) 35                      b) 75  
 c) 55                      d) 25
- Q.43 If A381 is divisible by 11, find the value of the smallest natural number A.  
 a) 5                      b) 6  
 c) 7                      d) 9
- Q.44 Dilip's position from the left in a row of students is 10th and Jagdish's position is 20th from the right. Both of them interchange their position and Jagdish becomes 23rd from the right. How many students are there in the row?  
 a) 33                      b) 44  
 c) 42                      d) 41                      e) 32
- Q.45 A mixture contains milk and water in the ratio 7:3. On adding 20 litres of water, the ratio of milk to water becomes 7:5. What is the total quantity of milk and water before adding water to it?  
 a) 10                      b) 100  
 c) 70                      d) 30
- Q.46 Lara cut small cubes of 1 cubic cm. each. She joined it to make a cuboid of length 10 cm., width 3 cm. and depth 3 cm. How many more cubes does she needs to make a perfect cube?  
 a) 750                      b) 250  
 c) 910                      d) 650
- Q.47 If PAINT is coded as 74128 and EXCEL is coded as 93596 then how would you encode ACCEPT?  
 a) 455978                      b) 547978  
 c) 554978                      d) 735961
- Q.48 What is the selling price of a car? If the cost of the car is ₹60 and a profit of 10% overselling price is earned.  
 a) 66                      b) 56  
 c) 46                      d) 36
- Q.49 If  $9x-3y=12$  and  $3x-5y=7$  then  $6x-2y=?$   
 a) -5                      b) 4  
 d) 8                      d) 2
- Q.50 A sum of ₹725 is lent in the beginning of a year at a certain rate of interest. After 8 months, a sum of ₹362.50 more is lent but at the rate twice the former. At the end of the year, ₹33.50 is earned as interest from both the loans. What was the original rate

of interest?

a) 3.6%

c) 5%

b) 4.5%

d) None of these

**End Semester Examination, May 2017**  
**B. Tech. – Fourth Semester**  
**CAREER SKILLS-II (HM-402)**

Time: 2hrs  
 Marks:50

Max

No. of

pages: 4

Note: *The paper consists of FIFTY multiple choice questions; Each question has FOUR options with ONE correct answer. Attempt all questions. All questions are of ONE mark each. There is no negative marking. Answer written in the answer table will be considered (Answer sheets with empty answer keys despite the correct options will not be evaluated).*

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
31.	32.	33.	34.	35.	36.	37.	38.	39.	40.
41.	42.	43.	44.	45.	46.	47.	48.	49.	50.

- Q.1 If 35% of a number is 112. Then what is the number?  
 a) 380                              b) 300  
 c) 320                              d) 350
- Q.2 The LCM of two numbers is 280 and their ratio is 7:8. What are the two numbers?  
 a) 70, 80                              b) 35, 40  
 c) 42, 48                              d) 28, 32
- Q.3 Find the average of 308, 142, 160, 245 and 25.  
 a) 176                              b) 178  
 c) 175                              d) 174
- Q.4 4, \*, 9,  $13\frac{1}{2}$  are in proportion. Then \* is:  
 a) 6                              b) 8  
 c) 9                              d) None of these.
- Q.5  $(112 \times 5^4) = ?$   
 a) 67000                              b) 70000  
 c) 76500                              d) 77200
- Q.6 Look at this series: 2, 6, 18, 54, ... What number should come next?  
 a) 108                              b) 162  
 c) 156                              d) 148
- Q.7 To complete a piece of work A and B take 8 days, B and C 12 days. A, B and C take 6 days.  
 a) 7 days                              b) 8 days  
 c) 7.5 days                              d) 8.5 days
- Q.8 By selling a watch for Rs. 495, a shopkeeper incurs a loss of 10%. Find the cost price of the watch for the shopkeeper.  
 a) Rs. 545                              b) Rs. 550  
 c) Rs. 555                              d) Rs. 565
- Q.9 Walking at the rate of 4kmph a man covers certain distance in 2hr 45 min. Running at a speed of 16.5 kmph the man will cover the same distance in:  
 a) 12 Minutes                              b) 25Minutes  
 c) 40 Minutes                              d) 60 Minutes
- Q.10 What is the probability of getting an even number in single throw of a dice?  
 a)  $\frac{2}{5}$                               b)  $\frac{1}{2}$   
 c)  $\frac{1}{3}$                               d)  $\frac{5}{6}$
- Q.11 Karan drives his car at a speed of 150 km/h. The time taken by him to cover 900 km, is:  
 a) 4 hour                              b) 5 hour  
 c) 6 hour                              d) 7 hour
- Q.12 A sum of money at simple interest amounts to Rs. 815 in 3 years and to Rs. 854 in 4 years. The sum is:  
 a) 650                              b) 690  
 c) 698                              d) 700
- Q.13 What is the probability of getting a sum 9 from two throws of a dice?  
 a)  $\frac{1}{6}$                               b)  $\frac{1}{8}$   
 c)  $\frac{1}{9}$                               d)  $\frac{1}{12}$
- Q.14 7. In how many ways playing eleven can be selected from 16 players of a cricket team?  
 a)  ${}^{16}C_{11}$                               b)  ${}^{16}P_{11}$   
 c) 16!                              d) None of these.
- Q.15 Two numbers are respectively 20% and 50% more than a third number. The ratio of the two numbers is  
 a) 2:5                              b) 3:5  
 c) 4:5                              d) 5:4
- Q.16 What is the Simple Interest, if P=Rs. 1000, R= 20% per annum, T = 4 years.  
 a) Rs. 400                              b) Rs. 600  
 c) Rs. 800                              d) Rs. 850
- Q.17 The average age of 10 students in a class is 20. If a new student is also included, then the new average age of all the students increases by 1. What is the age of the new student?  
 a) 21                              b) 30  
 c) 31                              d) 41
- Q.18 Deepak said to Nitin, "The boy playing with the football is the younger of the two brothers of the daughter of my father's wife." How is the boy playing football related to Deepak?  
 a) Cousin                              b) Brother  
 c) Son                              d) Brother-in-law
- Q.19 Three unbiased coins are tossed. What is the probability of getting at most two heads?  
 a)  $\frac{3}{4}$                               b)  $\frac{1}{4}$   
 c)  $\frac{3}{8}$                               d)  $\frac{7}{8}$

Q.20 Which one of the following is a prime number?

- a) 31                      b) 35  
c) 40                      d) 42

Q.21 A man sold an umbrella for Rs. 1800 and incurs a loss of 20%, then what is the cost price of the umbrella?

- a) 1440                      b) 2160  
c) 2250                      d) 2320





Q.22 There are 7 meetings A, B, C, D, E, F, G .one meeting should happen in one day. Meeting A is on Sunday C and D meetings should happen after B. Then E, F, G meetings should occur in three consecutive days. And meeting G is on Saturday. Then meeting D should occur on which day?

- a) Sunday                      b) Monday  
c) Wednesday                      d) Friday

Q.23 Reeya obtained 65, 67, 76, 82 and 85 out of 100 in different subjects, what will be the average?

- a) 70      b) 75      c) 80      d) 85

Q.24 Which of the following diagrams indicates the best relation between Earth, Sea and Sun?

- a)   
b)   
c)   
d) 

Q.25 The sum of ages of 5 children born at the intervals of 3 years each is 50 years. What is the age of the youngest child?

- a) 4                      b) 8  
c) 10                      d) None of these

Q.26 If 381A is divisible by 9, find the value of the smallest natural number A.

- a) 4                      b) 5  
c) 7                      d) 6

Q.27 In the AMS club, all the members participate either in the Tambola or the Fete. 420 participate in the Fete, 350 participate in the Tambola and 220 participate in both. How many members does the club have?

- a) 410                      b) 550  
c) 440                      d) 140

Q.28 Find the odd man out

1. 3, 5, 11, 14, 17, 21

- a) 21                      b) 17  
c) 14                      d) 3

Q.29 In what ratio must rice at Rs 9.30 per Kg be mixed with rice at Rs 10.80 per Kg so that the mixture be worth Rs 10 per Kg?

- a) 6:5                      b) 8:7  
c) 3:7                      d) 6:1

Q.30 A rectangular field is to be fenced on three sides leaving a side of 20 feet uncovered. If the area of the field is 680 sq. feet, how many feet of fencing will be required?

- a) 34                      b) 40  
c) 68                      d) 88

Q.31 To make a presentation impressive and effective you should use:

- a) Jargons  
b) Complex sentences  
c) Passive sentences  
d) A simple and active form of sentences

Q.32 To be able to give a good presentation, a full rehearsal is:

- a) Useful                      b) Optional  
c) Necessary                      d) Audience based

Q.33 Self-assessment in career planning helps you to know:

- a) What your talents & strengths are  
b) The activities you get most satisfaction from  
c) The talents you achieve most with  
d) All of the above

Q.34 Which of these behaviors in a team obstructs the achievement of the team's goal?

- a) Conflict                      b) Compliance  
c) Brain storming                      d) Commitment

Q.35 Which of these is a characteristic of high performance team where members believe in

- the integrity, character and ability of each other:
- a) Loyalty                      b) Worthiness
  - c) Openness                  d) Trust
- Q.36 Creativity is good only when it leads to:
- a) Lethargy                      b) Divinity
  - c) Trespassing                d) Productivity
- Q.37 I pass others' work as in my own work I am indulging in:
- a) Compassion                b) Plagiarism
  - c) Altruism                      d) Benevolence
- Q.38 Which of the following is the correct example to cite more than four authors for a work?
- a) Green, et al. (1995)
  - b) (Green, et al., 1995)
  - c) Both
  - d) None
- Q.39 Which of these is the fundamental pattern of cultural differences?
- a) Communication styles
  - b) Clothing Styles
  - c) Decision making style
  - d) All of the above
- Q.40 Stress can be defined as a negative emotional experience accompanied by
- a) Bio chemical & physiological changes
  - b) Behavioral changes
  - c) Cognitive changes
  - d) All of the above
- Q.41 Which of the following could be considered as a stress?
- a) Noise                      b) Commuting to work
  - c) Crowd                      d) All of the above
- Q.42 The idea of effective cross cultural communication is to:
- a) Respecting cultural differences & working together
  - b) Stereo typing a culture
  - c) Delegate work to the other person
  - d) Changing oneself as per the other culture
- Q.43 Which of these is an unhealthy way of coping with stress?
- a) Listen to music
  - b) Physical exercise
  - c) Over eating or under eating
  - d) Talking it out with family & friends
- Q.44 During a presentation what can one do to establish rapport with the audience?
- a) Giving relevant examples
  - b) Sharing relevant facts
  - c) Maintain eye contact
  - d) All of the above
- Q.45 Effective teams can:
- a) Be bought
  - b) Be faked
  - c) Be created through trust and competency
  - d) Exist without having a common goal
- Q.46 Diversity in teams are caused best by:
- a) Religion
  - b) Gender
  - c) Educational back ground
  - d) Competencies
- Q.47 In a self-awareness process, research can be done by
- a) Speaking with people involved in your area of interest
  - b) Shopping
  - c) Joining a dance school
  - d) Participating in GD
- Q.48 To cite several works by one author in different years, the reference is cited in which way?
- a) Jones (1992, 1994)
  - b) Jones (1994, 1992)
  - c) Both A and B
  - d) None of these
- Q.49 The visual aids used in a presentation need to be:
- a) Simple                      b) Have an impact
  - c) Easy to read                d) All of the above
- Q.50 Good presenters will
- a) Keep their hands on the podium
  - b) Gesture with their hands
  - c) Keep their hands in their pockets
  - d) Does not make a difference

# End Semester Examination, May 2017

B. Tech. – Fourth Semester

## QUANTITATIVE APTITUDE AND PERSONALITY DEVELOPMENT-I (HM-403A)

Time: 2hrs

Max

Marks:50

No. of

pages: 4

Note: *The paper consists of FIFTY multiple choice questions; Each question has FOUR options with ONE correct answer. Attempt all questions. All questions are of ONE mark each. There is no negative marking. Mention the correct options for each question in the answer key. (Answers marked outside the answer key will not be evaluated.)*

51.	52.	53.	54.	55.	56.	57.	58.	59.	60.
61.	62.	63.	64.	65.	66.	67.	68.	69.	70.
71.	72.	73.	74.	75.	76.	77.	78.	79.	80.
81.	82.	83.	84.	85.	86.	87.	88.	89.	90.
91.	92.	93.	94.	95.	96.	97.	98.	99.	100.



- Q.1 Group Discussion is a process of:
- Selecting the person who speaks continuously on the topic
  - Selecting the person who listens to others and doesn't speak on the topic
  - Selecting the person who speaks comprehensively and talks only when required
  - all of these.
- Q.2 The pre requisite of a group Discussion includes:
- Being Shy/ Isolated in GD
  - Interrupting another participant before his argument is over
  - Analyzing the topic logically
  - Changing Opinions.
- Q.3 "Accepting Criticism" in GD means:
- Get upset and react strongly
  - Be polite in telling the other person that the criticism is flimsy
  - If the criticism is flimsy, criticize the other person who is criticizing you
  - Just ignore and keep talking
- Q.4 "You never get a second chance to make a first impression." It means:
- Create the impression by dressing up well.
  - Create an impression by speaking well.
  - Create an impression by showing your academic records.
  - Create a lasting impression by the right combination of attitude, conduct and delivery.
- Q.5 "If you are early, you are on time. If you are on time, you are late", it means:
- Reach the venue exactly on time
  - Reach the venue 15 minutes before the start of GD
  - Reach the venue 5 minutes before the start of GD
  - It's ok to be late at times.
- Q.6 "Dress to impress" is important because:
- One needs to show the latest dress one has bought.
  - Dress plays a part in how you're first perceived.
  - Dress can make the evaluator think that you have nice choice of clothes.
  - Dress up the way you feel most comfortable.
- Q.7 A good hand shake would mean:
- Shaking hands till the introduction continues
  - Holding the hand firmly and tightly.
  - Extending the hand in the most confident, firm yet polite manner
  - Eye contact may be ignored during the hand shake
- Q.8 "Posture" in interview would mean:
- Lean & Forward
  - Slouch and Hunch
  - Straight & upright
  - Slide & Comfortable.
- Q.9 A "good impression" would mean
- Good Verbal's & Non verbal's
  - Good academic Records
  - Good sport records
  - Good Extra Curricular records
- Q.10 The answer to the question "Why should we hire you?" Should be:
- I am the best and would do the job at my best.
  - I am the best among the people you have just met.
  - All my teacher and friends like me.
  - It will give me a platform to showcase my skills.
- Q.11 The answer to the question "How long would you expect to work for us if hired?" Would be:
- Till 5' o clock
  - Till I keep getting foreign assignments
  - Till I keep getting good salary
  - Till I feel challenged professionally
- Q.12 Researching the organization is important because:
- To increase your general Knowledge.
  - To know what all company is doing.
  - To match the knowledge that you have with the company profile.
  - To plan your career path with the company.
- Q.13 The question "Tell me something about yourself" is to check:

- a) How well you speak about yourself.  
b) Whatever you have written in your CV is true or not.  
c) How confident you are about yourself and your skill sets.  
d) How well versed you are about talking in English.
- Q.14 The true purpose of an Interview is to:  
a) To get a job.  
b) Take the experience of sitting in an interview.  
c) To know the kind of jobs available in the market.  
d) To see if your skills matches with what the employer is looking for.
- Q.15 An interview portfolio bag should have:  
a) Master Application  
b) Copies of resume  
c) Certificates and Accomplishments  
d) All of these
- Q.16 Which of the following is a "Do" in a group discussion?  
a) Argue and Shout  
b) Mention erratic statistics  
c) Snatch your chance  
d) None of the above
- Q.17 Which of the following is a must in the group discussion?  
a) Summarize if conclusion is not possible  
b) Make shorter 3-4 contributions  
c) Put down your thoughts  
d) All of the above
- Q.18 Which of the following is a "No" in the group discussion?  
a) Dominate the discussion  
b) Grabbing attention  
c) Give others chance  
d) a and b
- Q.19 Which of the following is the incorrect body language in group discussion?  
a) Display of confidence  
b) Outburst of emotions  
c) Angry expressions  
d) Faking figures
- Q.20 Which of the skills is gauged through Group Discussion?  
a) Flexibility                      b) Managerial Skills  
c) Leadership Skills              d) a and c
- Q.21 The step for Effective presentation includes:  
a) Plan                                  b) prepare  
c) Practice                              d) All of the above
- Q.22 Question to be answered to decide what to present includes:  
a) To whom am I presenting?  
b) Where will this take place?  
c) When will this take place?  
d) All of the above.
- Q.23 Goals for presentation are:  
a) Provide a global perspective  
b) Vague, nonspecific, general  
c) None of the above  
d) All of the above
- Q.24 A Presentation involves:  
a) Introduction  
b) Body of the presentation  
c) Conclusion  
d) All of the above
- Q.25 Effective Non Verbal delivery involves:  
a) Eye Contact                      b) Physical Delivery  
c) Facial Expression              d) All of the above
- Q.26 If the numerator of a fraction is increased by 20% and its denominator is diminished by 25% value of the fraction is  $\frac{2}{15}$ . Find the original fraction:  
a)  $\frac{1}{12}$                                   b)  $\frac{1}{8}$   
c)  $\frac{1}{6}$                                   d)  $\frac{1}{4}$
- Q.27 Ram professes to sell his goods at the cost price but he made use of 900 gms instead of a kg, what is the gain %?  
a) 11%                                  b)  $11\frac{2}{9}\%$   
c)  $11\frac{1}{9}\%$                               d) 10
- Q.28 If Rs. 782 be divided into three parts, proportional to  $\frac{1}{2} : \frac{2}{3} : \frac{3}{4}$ , then the first part is?  
a) 182                                  b) 190  
c) 192                                  d) 204
- Q.29 A is half good a work man as B and together they finish a job in 14 days. In how many days working alone B finish the job?

- a) 20                      b) 21  
c) 22                      d) 23
- Q.30 Two pipes can fill a tank in 8 hours and 10 hours. If two pipes are opened simultaneously, In how much time will the tank be filled?  
a) 4hrs 18min                      b) 10min  
c) 4hrs                      d) 12hrs 10min
- Q.31 The average of 11 numbers is 10.9. If the average of the first six numbers is 10.5 and that of the last six numbers is 11.4, then the middle number is  
a) 10.5                      b) 11.5  
c) 12.5                      d) 13.5
- Q.32 In what ratio must a grocer mix two varieties of pulses costing Rs. 15 and Rs. 20 per kg respectively so as to get a mixture worth Rs. 16.50 kg?  
a) 3:7                      b) 5:7  
c) 7:3                      d) 7:5
- Q.33 The compound interest on Rs.30000 at 7 % per annum is Rs.4347. The period (in years) is  
a) 2 years                      b) 2.5years  
c) 3 years                      d) 4 years
- Q.34 If the cost price of 12 pens is equal to the selling price of 8 pens, the gain percent is?  
a) 12%                      b) 30%  
c) 50%                      d) 60%
- Q.35 5% people of a village in Sri Lanka died by bombardment, 15% of the remainder left the village on account of fear. If now the population is reduced to 3553, how much was it in the beginning?  
a) 3800                      b) 4200  
c) 4400                      d) 5500
- Q.36 A, B and C have Rs.500 between them, A and C together have Rs.200 and B and C Rs.350. How much does C have?  
a) Rs.50                      b) Rs.75  
c) Rs.100                      d) Rs.150
- Q.37 A, B and C can do a piece of work in 24, 30 and 40 days respectively. They start the work together but C leaves 4 days before the completion of the work. In how many days is the work done?  
a) 15 days                      b) 14 days  
c) 13 days                      d) 11 days
- Q.38 Tarun got 30% concession on the labelled price of an article and sold it for Rs. 8750 with 25% profit on the price he bought. What was the labelled price?  
a) 10000                      b) 12000  
c) 13000                      d) 14000
- Q.39 A and B can do a piece of work in 3 days, B and C in 4 days, C and A in 6 days. How long will C take to do it?  
a) 18 days                      b) 20days  
c) 24 days                      d) 30 days
- Q.40 A Shopkeeper sells two articles at Rs.1000 each, making a profit of 20% on the first article and a loss of 20% on the second article. Find the net Profit or loss that he makes.  
a) 4% Gain                      b) 6% Loss  
c) 4% Loss                      d) 6% Gain
- Q.41 One pipe can fill a tank twice as fast as another pipe. If together the two pipes can fill the tank in twelve minutes, then the slower pipe alone will be able to fill the tank in be able to fill:  
a) 30min                      b) 33min  
c) 36min                      d) 35min
- Q.42 The average of five consecutive odd numbers is 61. What is the difference between the highest and lowest numbers?  
a) 4                      b) 8  
c) 12                      d) 16
- Q.43 How many kilogram of sugar costing Rs. 9 per kg must be mixed with 27 kg of sugar costing Rs. 7 per kg so that there may be a gain of 10% by selling the mixture at Rs. 9.24 per kg?  
a) 36 kg                      b) 42 kg  
c) 54 kg                      d) 63 kg
- Q.44 Sohan received a sum at 12 % p.a simple interest. After 5 years he returned the principal and interest. If he returned Rs. 16000. What was the principal amount?  
a) Rs. 9000                      b) Rs. 9500  
c) Rs. 10000                      d) Rs. 10500

- Q.45 Three pipes P, Q and R can fill a tank in 6 hours, after working together for 2 hours, R is closed and P and Q can fill the remaining part in 7 hours. How much time will R take alone to fill the tank?
- a) 16 hours                      b) 14 hours  
c) 12 hours                      d) 10 hours
- Q.46 If goods be purchased for Rs.840 and one-fourth be sold at a loss of 20% at what gain percent should the remainder be sold so as to gain 20% on the whole transaction?
- a) 30%                      b) 33%  
c)  $33\frac{1}{3}\%$                       d) 35%
- Q.47 A person was asked to subtract 25% of a number from the original but he subtracted 25 from the number. His answer was 25 more than correct one. What was the original number?
- a) 160                      b) 180  
c) 225                      d) 200
- Q.48 3 men or 6 women can do a piece of work in 20 days. In how many days will 12 men and 8 women do the same work?
- a)  $7/2$                       b)  $15/4$   
c) 5                      d) 4
- Q.49 In a group of 80 children and 10 youngsters, each child got sweets that are 15% of the total number of children and each youngster got sweets that are 25% of the total number of children. How many sweets were there?
- a) 1160                      b) 1100  
c) 1080                      d) 1210
- Q.50 How much time will it take for an amount of Rs. 9 to yield Rs. 8 as interest at  $\frac{4}{3}\%$  per annum of simple interest?
- a) 2 years                      b) 3 years  
c) 1 years                      d) 4 years

**End Semester Examination, May 2017**  
**B. Tech.–Fifth/Sixth Semester**  
**INDUSTRIAL MANAGEMENT (HM-501)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) Discuss nature of management.
  - b) Define material management.
  - c) What are the functions of management?
  - d) What is the importance of directing?
  - e) How does planning function assist control function?
  - f) What is the importance of store management?
  - g) What is economic order quantity?
  - h) What is span of control?
  - i) Define employee welfare.
  - j) What is TQM?

2 × 10

**PART-A**

- Q.2 Define management. Discuss the process of controlling with the help of a diagram. 20
- Q.3 What is importance of a plant layout? Discuss the types of layout with their merits and demerits. 20
- Q.4 Define method study explain the procedures of method study with the help of a diagram. 20

**PART-B**

- Q.5
- a) Explain functions of inventory control. 5
  - b) Explain inventory control methods of ABC analysis. 15
- Q.6 What is importance of good industrial relations? Discuss the concept of worker's participation in management. 20
- Q.7 What is meaning of quality control? Discuss the methods of quality control. 20

**End Semester Examination, May 2017**  
**B. Tech.–Fifth/Sixth Semester**  
**INDUSTRIAL MANAGEMENT (HM-501)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) What is importance of directing?
  - b) What are advantages of product layout?
  - c) What are factors considered for selection of locality for a plant location?
  - d) Give two definitions of management.
  - e) Define work study.
  - f) Define inspection.
  - g) What is span of control?
  - h) What is standard time?
  - i) What is ABC analysis?
  - j) Define quality control.
- 2 × 10

**PART-A**

- Q.2 What is organizing? Discuss the principles of organizing. 20
- Q.3 Define plant layout. Discuss the types of layout with the help of a diagram. 20
- Q.4 Define work study. Explain in details the steps involved in carrying out method study. 20

**PART-B**

- Q.5 What are objectives of material management? Discuss the costs associated with material management and derive expression for EOQ. 20
- Q.6 Discuss the concept and scope of employee welfare. 20
- Q.7 What is TQM? Discuss various elements of TQM in detail. 20

**End Semester Examination, May 2017**  
**B. Tech.–Fifth / Sixth Semester**  
**INDUSTRIAL MANAGEMENT(HM-501)**

Time: 3 hrs

Max Marks:100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

Q.1 Answer (*any four*) questions from the following:

- a) Discuss the nature of management.
- b) Discuss the problems of plant layout.
- c) What are the objectives of work study?
- d) Draw and explain a BIN Card.
- e) Discuss the importance of industrial relations.
- f) Discuss the concept of quality circles.

5x4

**PART-A**

- Q.2 Define planning function of management. Discuss the process of planning in detail. 20
- Q.3 Define plant layout. Discuss the types of layout with the help of suitable diagrams. 20
- Q.4 Discuss and draw various types of associated charts and diagrams with work study. 20

**PART-B**

- Q.5 What is economic order quantity? Discuss EOQ model in detail. 20
- Q.6
- a) What do you mean by Industrial Relations? 5
  - b) Discuss the concept of workers participation in management. 15
- Q.7
- a) Discuss the importance of quality control. 10
  - b) Define inspection. Discuss its types in detail. 10

**End Semester Examination, May 2017**  
**B. Tech. – Fifth Semester**  
**CAREER SKILLS - III (HM-503A)**

Time: 2hrs  
50

Max Marks:

*No. of*

*pages: 3*

**Note:** *The paper consists of FIFTY multiple choice questions; Each question has FOUR options with ONE correct answer. Tick (✓) the correct answer. Attempt all questions. All questions are of ONE mark each. There is no negative marking.*



- Q.1 The ratio of boys and girls in a class of 72 is 7:5. How many more girls should be admitted to make the number of boys and girls equal?  
a) 9                                      b) 12  
c) 220                                    d) 240
- Q.2 The product of two numbers is 2028 and their H.C.F. is 13. The number of such pairs is:  
a) 1                                        b) 2  
c) 3                                        d) 4
- Q.3 I buy 15 pens and sells 12 of them at the cost price of 18 pens. What is my profit percentage?  
a) 25%                                    b) 50%  
c) 60%                                    d) 75%
- Q.4 A hall is 15 m long and 12 m broad. If the sum of the areas of the floor and the ceiling is equal to the sum of the areas of four walls, the volume of the hall is:  
a) 720                                      b) 900  
c) 1200                                    d) 1800
- Q.5 How many sides a regular polygon has with its interior angle eight times its exterior angles?  
a) 16                                        b) 24  
c) 18                                        d) 20
- Q.6 In a shower, 5 cm of rain falls. The volume of water that falls on 1.5 hectares of ground is:  
a) 75 cu.m                                b) 750 cu.m  
c) 7500 cu.m                            d) 75000 cu.m
- Q.7 A trader marked the selling price of an article at 10% above the cost price. At the time of selling, he allows certain discount and suffers a loss of 1%. He allowed a discount of?  
a) 9%                                        b) 10%  
c) 10.5%                                   d) 11%
- Q.8 There would be 15% loss if sugar is sold at Rs 10.2 per kg. If a profit of 10% is to be earned, at what price per kg should sugar be sold?  
a) Rs 14.50                                b) Rs 13.20  
c) Rs 15.10                                d) Rs 16
- Q.9 A tap can fill a tank in 6 hours. After half the tank is filled, three more similar taps are opened. What is the total time taken to fill the tank completely?  
a) 3 hrs 15 min                            b) 3 hrs 45 min  
c) 4 hr                                        d) 4 hrs 15 min
- Q.10 What number should be subtracted from  $x^3 + 4x^2 - 7x + 12$  if it is to be perfectly divisible by  $x + 3$ ?  
a) 41                                        b) 39  
c) 13                                        d) None of these
- Q.11 A bat is bought for \$ 120 and sold for \$ 105. The loss percent is \_\_\_\_\_.  
a)  $12\frac{1}{2}\%$                                     b)  $14\frac{1}{5}\%$   
c) 15%                                        d)  $16\frac{2}{3}\%$
- Q.12 A number when divided by a divisor leaves a remainder of 24. When twice the original number is divided by the same divisor, the remainder is 11. What is the value of the divisor?  
a) 13                                        b) 59  
c) 35                                        d) 37
- Q.13 To complete a piece of work A and B take 8 days, B and C 12 days. A, B and C take 6 days. A and C will take:  
a) 7 days                                    b) 8 days  
c) 7.5 days                                d) 8 days
- Q.14 A man buys a cycle for Rs. 1400 and sells it at a loss of 15%. What is the selling price of the cycle?  
a) 1090                                      b) 1160  
c) 1190                                      d) 1202
- Q.15 In a mixture of 60 liters, the ratio of milk and water is 2: 1. If this ratio is to be 1: 2, then the quantity of water to be further added is:  
a) 20 liters                                    b) 30 liters  
c) 40 liters                                    d) 60 liters
- Q.16 The sum of three numbers is 98. If the ratio of the first to second is 2 : 3 and that of the second to the third is 5 : 8, then the second number is:  
a) 20                                        b) 30  
c) 48                                        d) 58
- Q.17 The fourth proportional to 5, 8, 15 is:  
a) 18                                        b) 24

- c) 19                                      d) 20
- Q.18 In a bag, there are coins of 25 p, 10 p and 5 p in the ratio of 1:2: 3. If there is Rs. 30 in all, how many 5 p coins are there?  
a) 50                                      b) 100  
c) 150                                      d) 200
- Q.19 A person crosses a 600 m long street in 5 minutes. What is his speed in km per hour?  
a) 7.2                                      b) 3.6  
c) 10                                        d) 8.4
- Q.20 What percentage of numbers from 1 to 70 has 1 or 9 in the unit's digit?  
a) 1                                        b) 14  
c) 20                                      d) 21
- Q.21 Procrastination is a term related to:  
a) Problem Solving    b) Time Management  
c) Delegation        d) Stress Management
- Q.22 Which of the following is okay to do at an interview?  
a) Ask the employer questions  
b) Answer your cell phone  
c) Be a few minutes late  
d) None of the Above
- Q.23 Cause and Effect Analysis helps you in  
a) Paraphrasing  
b) Problem Solving  
c) Stress Management  
d) Customer Engagement
- Q.24 Scheduling is a term related to:  
a) Problem Solving    b) Time Management  
c) Delegation        d) Stress Management
- Q.25 Facebook is:  
a) Urgent/ Important  
b) Urgent/ Not Important  
c) Not Urgent  
d) Not Important
- Q.26 Which one of the following is short lived?  
a) Emotions                      b) Mood  
c) Stress                            d) Anxiety
- Q.27 I am a participant in a GD and I am the first one to speak. By doing so I am pitching myself as a  
a) Leader                            b) Good Communicator  
c) Good Listener    d) None of the Above
- Q.28 Group discussions are conducted to test the following  
a) Knowledge                      b) Communication  
c) Leadership                      d) All of the above
- Q.29 Which of the following activities deserve some of your time?  
a) Urgent/ Important  
b) Urgent/ Not Important  
c) Not Urgent/ Not Important  
d) Not Urgent/ Important
- Q.30 The visual aids used in a presentation needs to be:  
a) Simple                              b) Have an impact  
c) Easy to read                      d) All of the above
- Q.31 Which of the following could be considered as a stress?  
a) Noise                                b) Commuting to work  
c) Crowd                                d) All of the above
- Q.32 Which of these is an unhealthy way of coping with stress?  
a) Listen to music  
b) Physical exercise  
c) Over eating or under eating  
d) Talking it out with family & friends
- Q.33 Chronology of events in a CV is  
a) First to Current  
b) Current to First  
c) Both  
d) None
- Q.34 Cover Letter and CV are best when  
a) Standard                            b) Customized  
c) Both                                    d) None
- Q.35 Which of the following is okay to do at an interview?  
a) Ask the employer questions  
b) Answer your cell phone  
c) Be a few minutes late  
d) None of the Above
- Q.36 The résumé of a fresh graduate is generally:  
a) half a page                      b) two pages long  
c) three pages long    d) one page long

- Q.37 A summary placed at the beginning of the CV acts as a:
- Statement of objectives
  - Synopsis
  - Letter of recommendation
  - Preface
- Q.38 The first objective in a group discussion is to:
- Prove your superiority
  - Catch the group's attention
  - Create sub-groups
  - Act as a self-appointed leader of the group
- Q.39 First step in managing an irate customer is:
- Listening
  - Probing
  - Cushioning
  - Apologizing
- Q.40 I am a participant in a GD. I, realizing that the group is losing focus on the topic, bring the group back on the topic. This makes me a:
- Moderator
  - Channelizer
  - Contributor
  - Initiator
- Q.41 What is the tendency to postpone things called?
- Overreaching
  - Procrastination
  - Delegation
  - Remuneration
- Q.42 Case studies are used in GD's to test:
- Analytical Skills
  - Decision Making
  - Both
  - None
- Q.43 I want to make an effective CV. My CV must have:
- Project Details
  - Scholastics
  - Achievements and Awards
  - All of the above
- Q.44 You're asked a really difficult question. You don't know the answer off the top of your head, so you:
- "That's a tough question. I'm really not sure."
  - Say the first thing that comes to mind.
  - Take a deep breath and think of an answer while paraphrasing the question.
  - None of the Above.
- Q.45 How early should you arrive to the interview?
- 30 Minutes
  - 10 Minutes
  - 1 Minutes
  - None of the above
- Q.46 The purpose of an interview is:
- To match employees with the employer that best suits them, and vice versa.
  - For the job candidate to talk about his achievements.
  - For the employer to test the interviewee by asking tricky questions
  - All of the above
- Q.47 If I am selling 500 GB of Hard drive instead of 250 GB, I am:
- Up selling
  - Cross Selling
  - Mis-selling
  - None of the Above
- Q.48 If I sell a Center Table with a Sofa then I am
- Up selling
  - Cross Selling
  - Mis-selling
  - None of the Above
- Q.49 Career Plan is:
- Life long process
  - Acquiring skills
  - Changing Careers
  - All of the above
- Q.50 SWOT analysis helps you
- Plan Better
  - Identify things that go in your favor
  - Identify pitfalls
  - All of the above

**End Semester Examination, May 2017**  
**B. Tech. – Sixth Semester**  
**INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP (HM-504)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) What is planning in management?
  - b) What is plant layout?
  - c) Draw a bin card.
  - d) Discuss the importance of industrial relations.
  - e) What is workers participation in management?
  - f) Draw a store ledger account.
  - g) Discuss nature of management.
  - h) Write a few technique of inventory control.
  - i) Discuss the need of employee welfare.
  - j) Define controlling.

2x10

**PART-A**

- Q.2
- a) Define Management. Discuss the process of controlling with the help of a diagram. 10
  - b) What is organizing? Discuss the principles of organizing. 10
- Q.3 Describe the steps in finding plant location. What are the merits and demerits? 20
- Q.4
- a) Mention briefly the key aspects of effective management of inventory. How does it help towards reduction of operational costs and better profitability? 10
  - b) Discuss the ABC technique of inventory control in detail. 10

**PART-B**

- Q.5 Discuss industrial relations and their importance and objectives. 20
- Q.6
- a) What are DICS? What is their role towards industrial development? 10
  - b) Discuss the role of NABARD in supporting entrepreneurs. 10
- Q.7 Imagine you are setting up a business concern. Give all the details of the type of business, method of setting up, key steps that you would take to set up such a business, with financial projections on revenues and expenditures. 20

**End Semester Examination, May 2017**  
**B. Tech.–Fifth/ Sixth Semester**  
**INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP (HM-504)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

Q.1 Answer the following:

- a) What is the importance of directing?
- b) Mention important steps in finding a suitable site for plant location.
- c) What are the objectives of good industrial relations?
- d) Define 'the role of NABARD'.

5 × 4

**PART-A**

Q.2 Define 'management'. Discuss the process of controlling with the help of a diagram. 20

Q.3 Discuss the factors influencing a layout and major problems of a layout. 20

Q.4 Discuss ABC control in inventory management and the role of V.E.D. analysis in improving it further. 20

**PART-B**

Q.5 What is the concept of workers' participation in management? Discuss the objectives of the same in detail. 20

Q.6 What is employee welfare? Discuss the scope of employee welfare in detail. 20

Q.7 Discuss the role of following in supporting entrepreneurs:

- a) Commercial Banks.
- b) District industry centres.

10 × 2

**End Semester Examination, May 2017**  
**B. Tech. – Fifth Semester**  
**QUANTITATIVE APTITUDE AND PERSONALITY DEVELOPMENT-II**  
**(HM-505)**

Time: 2 hrs.

Max Marks:50

No. of pages: 4

**Note:** *The paper consists of FIFTY multiple choice questions; each question has FOUR options with ONE correct answer. Select the correct answer. Attempt all questions. All questions are of ONE mark each. There is no negative marking. Mention the correct option for each question in the blank answer key given herein below. (Answer sheets with empty answer keys despite the correct options being ticked will not be evaluated.)*

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
31.	32.	33.	34.	35.	36.	37.	38.	39.	40.
41.	42.	43.	44.	45.	46.	47.	48.	49.	50.

- Q.1 How many litres of pure acid are there in 8 litres of a 20% solution  
a) 1.5                      b) 1.6  
c) 1.7                      d) 1.8
- Q.2 If number  $x$  is 10% less than another number  $y$  and  $y$  is 10% more than 125, then find out the value of  $x$   
a) 123.55                  b) 123.65  
c) 123.75                  d) 123.85
- Q.3 A and B together have ₹ 1210. If  $\frac{4}{15}$  of A's amount is equal to  $\frac{2}{5}$  of B's amount, how much amount does B have?  
a) ₹ 460                  b) ₹ 484  
c) ₹ 550                  d) ₹ 664
- Q.4 In a class there are 20 boys and 15 girls. The ratio of boys to girls is:  
a) 4:3                      b) 3:4  
c) 4:5                      d) none of these
- Q.5 If ₹ 782 be divided into three parts, proportional to  $\frac{1}{2} : \frac{2}{3} : \frac{3}{4}$ , then the first part is:  
a) ₹ 182                  b) ₹ 190  
c) ₹ 196                  d) ₹ 204
- Q.6 The sum of first five prime numbers is:  
a) 11                      b) 18  
c) 26                      d) 28
- Q.7 The difference of two numbers is 1365. On dividing the larger number by the smaller, we get 6 as quotient and the 15 as remainder. What is the smaller number?  
a) 240                      b) 270  
c) 295                      d) 360
- Q.8 Insert the missing number. 12, 25, 49, 99, 197, 395, (...)  
a) 31                      b) 42  
c) 46                      d) 56
- Q.9  $5 \times 4! = ?$   
a) 90                      b) 105  
c) 120                      d) 135
- Q.10  $10. 6!/4! = ?$   
a) 24                      b) 26  
c) 28                      d) 30
- Q.11 Worker A takes 8 hours to do a job. Worker B takes 10 hours to do a job. How long should it take both A and B, working together to do same job.  
a)  $4/9$                       b)  $2 \frac{4}{9}$   
c)  $34/9$                       d)  $4 \frac{4}{9}$
- Q.12 A and B can together complete a piece of work in 4 days. If A alone can complete the same work in 12 days, in how many days can B alone complete that work?  
a) 4 days                  b) 5 days  
c) 6 days                  d) 7 days
- Q.13 Pipe A can fill a tank in 5 hours, pipe B in 10 hours and pipe C in 30 hours. If all the pipes are open, in how many hours will the tank be filled?  
a) 2.5 hours              b) 2 hours  
c) 3.5 hours              d) 3 hours
- Q.14 Two pipes A & B can fill the tank in 12 hours and 36 hours respectively. If both the pipes are

opened simultaneously, how much time will be required to fill the tank?

- a) 6 hours                      b) 9 hours
- c) 12 hours                    d) 15 hours

Q.15 A TV is purchased at ₹ 5000 and sold at ₹ 4000, find the lost percent.

- a) 10%                        b) 20%
- c) 25%                        d) 28%

Q.16 A man travelled a distance of 90Km in 9 hours partly on foot at 8 kmph and partly on bicycle at 17 kmph. Find the distance travelled on foot.

- a) 46 kms                      b) 56 kms
- c) 62 kms                      d) 52 kms

Q.17 Out of 7 consonants and 4 vowels, how many words of 3 consonants and 2 vowels can be formed?

- a) 210                         b) 1050
- c) 25200                      d) 21400

Q.18 At present, the ratio between the ages of Amit and Dhiraj is 5 : 4. After 6 years, Amit's age will be 26 years. What is the age of Dhiraj at present?

- a) 12 years                    b) 16 years
- c) 19½ years                d) 21 years

Q.19 If the ratio of the ages of Shweta and Veena was 5:6 six years ago and it will become 10:11 in 4 years from now, then find the present age of Veena

- a) 16 years                    b) 18 years
- c) 10 years                    d) 12 years

Q.20 A father said to his son, "I was as old as you are at the present at the time of your birth". If the father's age is 38 years now, the son's age five years back was:

- a) 19 years                    b) 14 years
- c) 33 years                    d) 38 years

Q.21 According to time matrix, things which are urgent as well as important should be:

- a) Done now.
- b) Done quickly.
- c) Spent most time on.
- d) Rejected.

Q.22 Which of the following is not a scheduling tool?

- a) To do lists.
- b) Appointment calendars.
- c) Scheduling software.
- d) Reverse delegation.

Q.23 The first step of problem solving process is:

- a) Evaluating and selecting alternatives
- b) Generating alternatives.
- c) Defining the problem.
- d) Implementing solutions.

Q.24 The Simplex process of problem solving has how many stages?

- a) 4                              b) 5
- c) 8                              d) 10

Q.25 A complete knowledge of self by analysing one's strengths and weaknesses depicts a high level of:



- a) Self-awareness.
- b) Self-regulation.
- c) Empathy.
- d) Internal Motivation.

Q.26 The ability to identify the needs, wants and viewpoints of others is called as:

- a) Sympathy.
- b) Empathy.
- c) Self Actualisation.
- c) Motivation.

Q.27 The concept of emotional intelligence has been made popular by:

- a) Min Basadur.
- b) Max Weber.
- c) McGregor.
- d) Daniel Goleman.

Q.28 The foundation of EI development in any individual is:

- a) Self Awareness.
- b) Self-Regulation.
- c) Empathy.
- d) Social Skills.

Q.29 The correct representation of various factors impacting the first impression is :

- a) Body Language 3%, Verbal content 38%, verbal tone 55%.
- b) Verbal Tone 3%, verbal content 38%, body language 55%.
- c) Verbal content 3%, verbal tone 38%, body language 55%.
- d) None of the above.

Q.30 The pinnacle of customer satisfaction is called:

- a) Customer feedback.
- b) Customer awareness.
- c) Customer meet.
- d) Customer delight.

Q.31 Ghost shopping is notused for gaining the knowledge of:

- a) Competitor's products.
- b) The placement of your product in the outlet.
- c) The features of your product.
- d) Visibility of the product.

Q.32 Trust + Experience =

- a) Understanding
- b) Knowledge
- c) Compatibility
- d) Credibility

Q.33 Out of "Features", "Advantages" and "Benefits", the customer is usually most interested in:

- a) Features.
- b) Advantages.
- c) Benefits.
- d) None of the above.

Q.34 Negotiation with the prospect begins:

- a) The moment you meet the customer.

- b) After the initial exchange of pleasantries.
- c) After you have presented the product and services and handled the customer objections.
- d) After the sales process.

Q.35 The ultimate aim of a negotiation process is to :

- a) Sell the product.
- b) Achieve a win-win situation.
- c) To increase the market for the product.
- d) None of the above.

Q.36 The most commonly used format in curriculum vitae is:

- a) Chronological order.
- b) Reverse chronological order.
- c) Hybrid.
- d) Functional.

Q.37 While preparing a resume, the following point should be kept in mind:

- a) The resume should be short as recruiters do not have time to go through a bulky one.
- b) Many font styles should be used to make it look beautiful.
- c) Any number of font sizes can be used to fill up the page.
- d) Every word should be bolded, italicized or be in all caps.

Q.38 Which one thing should not be there in a good CV?

- a) Sports activities that you have participated in.
- b) Use of digits wherever possible.
- c) Accomplishments.
- d) Use of funny or controversial email address.

39. The main purpose of writing a cover letter is:

- a) The resume looks good with a cover letter.
- b) You may want to show your linguistic skills.
- c) It adds volume to the CV.
- d) To introduce yourself to the hiring manager, and to explain as to why you are the best fit for the job.

Q.40 While writing a cover letter, the following points should be strictly adhered to:

- a) It should not be more than one page document.
- b) Do some research about the company and the person to whom you are writing?
- c) State in brief as to how you came to know about the vacancy.
- d) All of the above.

Q.41 Qualities that are not required in group discussions are:

- a) Criticising
- b) Courtesy

- c) Communication skills
- d) Knowledge

Q.42 The basic difference between a group discussion and a debate is:

- a) In debate, you either speak in favour of the topic or against it, while in GD, you discuss the topic and try to achieve consensus.
- b) In debate, the topic is given well in advance while in GD, it is given at that very moment.
- c) In debate, you have sufficient time to prepare for the topic, while in GD, you are given just 4-5 minutes for gathering your thoughts.
- d) All of the above.

Q.43 Certain myths regarding the GD are:

- a) You should speak more.
- b) You should be aggressive.
- c) Both the above.
- d) None of the above.

Q.44 During a group discussion, the following points should be kept in mind

- a) Be a good listener.
- b) Initiate the discussion only if you are well versed with the topic.
- c) Backing your points with facts and figures.
- d) All the above.

Q.45 In GD, one point which can go totally against you could be;

- a) Being natural and calm.
- b) Asking irrelevant questions.
- c) Speaking to the point.
- d) Saying what you feel without going in favour or against the topic.

Q.46 The preparation for a personal interview does not include:

- a) Being up to date with your CV.
- b) Anticipating questions from the CV and identifying relevant answers/examples.
- c) Buying new fancy clothes for the interview.
- d) Researching about the organization and the job applied.

Q.47 Arriving at the venue of interview before time has the following advantages:

- a) The employer gets impressed.
- b) You are able to enjoy the food at the canteen.
- c) You may make friends with fellow candidates.
- d) You get sufficient time to settle down and gather yourself.

Q.48 The things required to form a good first impression on the employer include:

- a) Offering to shake hands with the interviewer.
- b) Admiring the beautiful paintings hanging on the wall.
- c) Smiling and maintaining eye contact with the interviewer.
- d) Wearing your expensive party dress.

Q.49 Dressing for success will not include:

- a) Neatly washed and ironed white shirt.
- b) Strong colognes and artistic pieces of jewellery.

- c) Polished shoes.
- d) Neatly groomed hair.

- Q.50 If the recruiter wants an example of leadership skills displayed by you, you should talk about:
- a) An excellent presentation that you gave to the class.
  - b) A job experience that you have.
  - c) A website that you have designed.
  - d) That you are a class rep. and/or the head of cultural committee.

## End Semester Examination, May 2017

### B. Tech. – Sixth Semester CAREER SKILLS (HM-602)

Time: 2hrs

Max

Marks:50

No. of

pages: 4

**Note:** *The paper consists of FIFTY multiple choice questions; Each question has FOUR options with ONE correct answer. Attempt all questions. All questions are of ONE mark each. There is no negative marking. Mention the correct options for each question in the answer key. (Answers marked outside the answer key will not be evaluated.) Calculator is not allowed.*

101.	102.	103.	104.	105.	106.	107.	108.	109.	110.
111.	112.	113.	114.	115.	116.	117.	118.	119.	120.
121.	122.	123.	124.	125.	126.	127.	128.	129.	130.
131.	132.	133.	134.	135.	136.	137.	138.	139.	140.
141.	142.	143.	144.	145.	146.	147.	148.	149.	150.

- Q.1 If the population of a town is decreased by 10% and then increased by 10%, the net effect on the population of the town is:  
a) A decrease of 99%   b) No change  
c) A decrease of 1%   d) An decrease of 1%
- Q.2 How many times the two hands of a clock meet in a day?  
a) 22                      b) 11  
c) 44                      d) 55
- Q.3 What percentage of numbers from 1 to 70 have 1 or 9 in the unit's digit?  
a) 1                        b) 14  
c) 20                      d) 21
- Q.4 A fruit seller had some apples. He sells 40% apples and still has 420 apples. Originally, he had:  
a) 588                      b) 672  
c) 600                      d) 700
- Q.5 A cone and a hemisphere have equal bases and equal volumes. Find the ratio of their heights.  
a) 1:2                      b) 2:1  
c) 3:1                      d) 3:4
- Q.6 Two numbers are respectively 20% and 50% more than a third number. The ratio of the two numbers is:  
a) 4:5                      b) 2:5  
c) 3:2                      d) 2:7
- Q.7 Salaries of Ravi and Sumit are in the ratio 2:3. If the salary of each is increased by Rs. 4000, the new ratio becomes 40:57. What is Sumit's salary?  
a) Rs. 17,000              b) Rs. 20,000  
c) Rs. 34,000              d) Rs. 38,000
- Q.8 The salaries A, B, C are in the ratio 2:3:5. If the increments of 15%, 10% and 20% are allowed respectively in their salaries, then what will be the new ratio of their salaries?  
a) 3:3:10    b) 10:11:20  
c) 23:33:6   d) Cannot be determined
- Q.9 The largest 4 digit number exactly divisible by 88 is:  
a) 9944                      b) 9988  
c) 8888                      d) None of these
- Q.10 What is the unit digit in  $\{(6374)^{1793} \times (625)^{317} \times (341^{491})\}$ ?  
a) 0            b) 2            c) 3            d) 5
- Q.11 How many 3 digit numbers are divisible by 6 in all?  
a) 149    b) 150    c) 151    d) 166
- Q.12  $8597 - ? = 7429 - 4358$   
a) 5430                      b) 5420  
c) 5526                      d) None of these
- Q.13 From a group of 7 men and 6 women, five persons are to be selected to form a committee so that at least 3 men are there on the committee. In how many ways can it be?  
a) 676                      b) 567  
c) 756                      d) 112
- Q.14 In how many ways can the letters of the word 'LEADER' be arranged?  
a) 72                        b) 36  
c) 360                      d) None of these
- Q.15 A cone and sphere have the same radius of 12 cm. Find the height of the cone if the cone and sphere have the same volume.  
a) 18cm                      b) 24 cm  
c) 36 cm                      d) 48 cm
- Q.16 A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?  
a) 10/21                      b) 11/21  
c) 13/21                      d) None of these

- Q.17 Two discounts of 60% and 20% equal to a single discount of  
 a) 70                              b) 65  
 c) 66                              d) 68
- Q.18 In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green?  
 a)  $\frac{1}{3}$                               b)  $\frac{1}{2}$   
 c)  $\frac{1}{4}$                               d)  $\frac{3}{13}$
- Q.19 Six bells commence tolling together and toll at intervals of 2, 4, 6, 8 10 and 12 seconds respectively. In 30 minutes, how many times do they toll together?  
 a) 4                              b) 10  
 c) 15                              d) 16
- Q.20 Sachin can cover a distance in 1hr 24 min by covering  $\frac{2}{3}$  of the distance at 4 kmph and the rest at 5 kmph. The total distance is?  
 a) 5 km    b) 6 km    c) 7 km    d) 8 km
- Q.21 The ratio between the speeds of two trains is 7:8. If the second train runs 400 km in 4 hours, then the speed of the first train is:  
 a) 67.5 kmph                      b) 57.5 kmph  
 c) 77.5 kmph                      d) 87.5 kmph
- Q.22 The ages of the two persons differ by 20 years. If 5 year ago, the older one be 5 times as old as the younger one, then their present ages, in year are:  
 a) 25, 5                              b) 30, 10  
 c) 35, 15                              d) None of these
- Q.23 If b equals 10% of a and c equals 20% of b, then which one of the following equals 30% of c?  
 a) 0.006% of a                      b) 0.0006% of a  
 c) 0.06% of a                      d) 0.6% of a
- Q.24 If father with 8 children takes 3 children at a time to the zoological garden, as often as he can without taking the same 3 children together more than once. Then:  
 a) Number of times he will go to zoological garden is 56.  
 b) Number of times each child will go to the zoological garden is 21  
 c) Number of times a particular child will not go to the zoological garden is 35  
 d) All of the above.
- Q.25 In what ratio must a grocer mix two varieties of pulses costing Rs. 15 and Rs. 20 per kg respectively so as to get a mixture worth Rs. 16.50 kg?  
 a) 3:7                              b) 7:3  
 c) 2:5                              d) 4:5
- Q.26 The age of Mr. Chetan in 2002 was  $\frac{1}{90}$  of his birth year. What is his age in 2006?  
 a) 30                              b) 28  
 c) 26                              d) 22
- Q.27 A merchant has 1000 kg of sugar, part of which he sells at 8% profit and the rest at 18% profit. He gains 14% on the whole. The quantity sold at 18% profit is:  
 a) 400 kg                              b) 450 kg  
 c) 550 kg                              d) 600 kg
- Q.28 A man has 1044 candles. After burning, he can make a new candle from 9 stubs left behind. Find the maximum number of candles that can be made.  
 a) 116                              b) 120  
 c) 130                              d) 140
- Q.29 A motorboat whose speed is 15 km/hr in still water goes 30km downstream and comes back in four and a half hours. The speed of the stream is:

- a) 4.5 km/hr                      b) 6 km/hr  
c) 7 km/hr                        d) 5 km/hr
- Q.30 Look at this series: 36, 34, 30, 28, 24, ... What number should come next?  
a) 20                                b) 22  
c) 23                                d) 26
- Q.31 While sitting for an interview, you should  
a) Maintain eye contact  
b) Be composed and poised  
c) Smile  
d) All of the above
- Q.32 Which of the following should be avoided in a Resume?  
a) Skills                            b) Education  
c) Hobbies                        d) Your Religion
- Q.33 A personal interview stresses on the following areas:  
a) Your Goal                      b) Knowledge  
c) Personality trait              d) All of the above
- Q.34 Which of the following is an example of body language?  
a) Body Posture                b) Pitch of voice  
c) Rate of speech              d) Volume of voice
- Q.35 I am a participant in a GD. I, realizing that the group is losing focus on the topic, bring the group back on the topic. This makes me a:  
a) Moderator                    b) Channelizer  
c) Contributor                  d) Initiator
- Q.36 In order to be an effective listener you should not:  
a) Maintain eye contact  
b) Resist distractions  
c) Paraphrase  
d) Interrupt
- Q.37 Making eye contact is a way of communicating:  
a) Interest                        b) Involvement  
c) Attention                      d) All of the above
- Q.38 In order to do well in a GD one should be:  
a) Speak clearly and confidently  
b) Speak continuously even if it's irrelevant  
c) Dominating  
d) Keep looking at the Jury/ Panel
- Q.39 When you have to speak about a topic without preparation, it is called:  
a) Extempore                    b) Debate  
c) Declamation                d) None
- Q.40 Example of Non verbal communication:  
a) Debate  
b) Group discussion  
c) Extempore  
d) Communication through body language
- Q.41 A good handshake is  
a) Elbow grasp  
b) Glove handshake  
c) The wrist hold  
d) A firm handshake with a smile and eye contact
- Q.42 The prime motive of a cover letter is to  
a) Highlight the items covered in the resume  
b) Show alignment towards the job description  
c) State the fact that resume is attached  
d) All of the Above
- Q.43 Tick the correct statement about Telephonic Interviews  
a) One may be casual in dress and conduct of interview  
b) One may select any location for the conduct  
c) One should select a quiet place for the interview  
d) Is not as important as a face to face interview
- Q.44 We should pick up our phone ideally in \_\_\_\_ or less rings

- a) 1                      b) 2
- c) 3                      d) 6

- Q.45 A re-statement of a text or passage is also known as
- a) Paraphrasing      b) Greeting
  - c) Referencing      d) Encoding
- Q.46 For an effective communication the subject should be
- a) Complex
  - b) Unfamiliar
  - c) Simple and familiar
  - d) None of the above
- Q.47 "After you", "May I", "Please allow me", "Thank you" are examples of
- a) Punctuality      b) Morality
  - c) Courtesy      d) Brutality
- Q.48 Which is the best dress code for boys for an interview?
- a) Casual              b) Shirt & Tie
  - c) Designer Suit      d) Business Suit and a tie
- Q.49 Which of the following is a strict NO during an interview?
- a) Making excuses
  - b) Making negative comments
  - c) Taking a cell phone call
  - d) All of the above
- Q.50 A resume is a:
- a) Formality
  - b) Irrelevant Employment Document
  - c) A very important employment document
  - d) None of the above



**End Semester Examination, May 2017**  
**B. Tech. – Sixth Semester**  
**QUANTITATIVE APTITUDE AND PERSONALITY DEVELOPMENT-IV**  
**(HM-603A)**

Time: 2hrs  
50

Max Marks:

No. of

pages: 5

Note: *The paper consists of FIFTY multiple choice questions; Each question has FOUR options with ONE correct answer. Attempt all questions. All questions are of ONE mark each. There is no negative marking. Mention the correct options for each question in the answer key. (Answers marked outside the answer key will not be evaluated.)*

151.	152.	153.	154.	155.	156.	157.	158.	159.	160.
161.	162.	163.	164.	165.	166.	167.	168.	169.	170.
171.	172.	173.	174.	175.	176.	177.	178.	179.	180.
181.	182.	183.	184.	185.	186.	187.	188.	189.	190.
191.	192.	193.	194.	195.	196.	197.	198.	199.	200.

- Q.1 The SWOT analysis of a person talks about the:
- Smartness, Weaknesses, Opportunities and Threats
  - Strengths, Words, Orderliness, and Time management
  - Strengths, weaknesses, Opportunities and Threats
  - Strong points, welfare, Opportunities and Time management
- Q.2 Which of the following statements is true about self introduction?
- A good self introduction lays a strong foundation for the rest of the interview.
  - It helps you to reflect confidence when the ice between you and the interviewer is being broken.
  - You have about 60 seconds for self introduction.
  - All of the above
- Q.3 Certain ground rules while participating in a group discussion are:
- Express ideas clearly and concisely.
  - Listen to what others have to say.
  - Talk for long periods; others should not be able to speak.
  - Only (A) and (B)
- Q.4 A resume should be:
- As lengthy as you want it to be.
  - A carefully crafted document not exceeding one side of an A-4 sheet
  - A colorful and visually attractive document
  - None of the above
- Q.5 A well-crafted and well-practiced Self Introduction helps you to:
- Present your first answer with poise and confidence.
  - Do away with fillers like umm, well, I guess etc.
  - Set a strong foundation for the rest of the interview.
  - All of the above
- Q.6 What should you do if you did not understand the question that the interviewer asked?
- Politely request him/her to repeat
  - Guess the answer
  - Smile and ignore the question
  - None of the above
- Q.7 What should you not do in an interview?
- Maintain eye contact with all panelists.
  - Sit smartly
  - Smile incessantly
  - Dress neatly
- Q.8 Which of the following statements is true about cover letter?
- A cover letter is a one page formal document sent with a resume
  - It is meant to introduce you to the hiring manager
  - To tell the employer as to why you are fit for the job
  - All of the above
- Q.9 While writing an email, which of the following points need to be kept in mind?
- We should not use ALL CAPS
  - Use attachments only when necessary
  - Bcc option should not be used
  - All of the above
- Q.10 "Tell me something about yourself" should be answered with
- Telling about your strengths only
  - Talking about your areas of improvement
  - Talking briefly about your family, education, industrial training, co-curricular activities, and work experience
  - None of the above
- Q.11 Which of the following should be checked before going for an interview?
- Wear neatly ironed formals without creases
  - The arms of the shirt should not be folded
  - Take care of your body odor
  - All of the above
- Q.12 The study of the use of distance in non-verbal communication is called:
- Haptics
  - Proxemics
  - Oculics
  - None of the above
- Q.13 The process of communication through sending and receiving wordless messages is called:
- Communication
  - Non-verbal communication
  - Interview process
  - None of the above

- Q.14 Which of the following cannot be considered as a good telephonic etiquette?
- Speak slowly so as to be understood
  - Listen to what other person has to say
  - Talk for long periods, others should not be able to speak
  - End the call with a polite Good bye or Thank You
- Q.15 Our emails should be courteous, as
- To leave the person reading the mail a good impression of us
  - We cannot impress the reader by our body language
  - Both A and B
  - There is no need to be courteous
- Q.16 In a resume, the educational credentials and the work experience should be mentioned in
- Chronological order
  - Reverse chronological order.
  - Any which way
  - None of the above
- Q.17 The duration of the group discussion is 15-20 minutes so that
- The objective of GD is achieved
  - To make the participants nervous
  - To ensure that everyone does not speak
  - To find the most vocal participants
- Q.18 If the interviewer asks, "Do you have any question?" we should
- Politely refuse
  - Ask something obvious
  - Negotiate the salary
  - Enquire about the job and its requirements
- Q.19 Any performance or speech carried out without preparation or forethought is called
- Debate
  - Group discussion
  - Extempore
  - None of the above
- Q.20 When is a cover letter submitted?
- While applying for a job
  - During the interview
  - After the interview
  - None of the above
- Q.21 The average score of 40 students in a Mathematics test is 50. If the highest and lowest scores were excluded, the average

score of the class would decrease by 1. If the difference of these 2 scores is 60, find the highest score?

- 84
- 95
- 99
- 115

- Q.22 A container contains pure milk. 10% of this is removed and replaced with water. Then 25% of this is removed and replaced with water and finally 30% of this is removed and replaced with water. What is the percentage of milk in the final solution?
- 47.25%
  - 48.75%
  - 35%
  - 65%

**Directions for questions 23 to 25:-**Answer the questions based on the passage below.

A group of three or four has to be selected from seven persons. Among the seven are two women: Fiza and Kavita, and five men: Ram, Shyam, David, Peter and Rahim. Ram would not like to be in the group If Shyam is also selected. Shyam and Rahim want to be selected together in the group. Kavita would like to be in the group only if David is also there. David, if selected, would not like Peter in the group. Ram would like to be in the group only if Peter is also there. David insists that Fiza be selected in case he is there in the group.

- Q.23 Which of the following is a feasible group of three?
- David, Ram and Rahim
  - Peter, Shyam and Rahim
  - Kavita, David and Shyam
  - Fiza, David and Ram
- Q.24 Which of the following is a feasible group in four?
- Ram, Peter, Fiza and Rahim
  - Shyam, Rahim, Kavita and David
  - Shyam, Rahim, Fiza and David
  - Fiza, David, Ram and Peter
- Q.25 Which of the following statements is true?
- Kavita and Ram can be part of a group of four
  - A group of four can have two women
  - A group of four can have all four men
  - None of these

- Q.26 Rs. 395 is divided among A, B and C in such a manner that B gets 25% more than A and 20% more than C. The share of A is?  
 a) Rs. 198                      b) Rs. 120  
 c) Rs. 180                      d) Rs. 195
- Q.27 Amar, Akbar and Anthony are friends, being looked after by a matron Farah. Amar weighs 50% more than Akbar and Anthony weighs 25% less than Amar. Farah weighs a third of the combined weight of the three boys. All four together weight 232 kg. The correct arrangement of the person in the ascending order of their weights is  
 a) Anthony, Akbar, Farah, Amar  
 b) Anthony, Akbar, Amar, Farah  
 c) Akbar, Anthony, Amar, Farah  
 d) Akbar, Anthony, Farah, Amar
- Q.28 If  $A + B$  means A is the sister of B;  $A \times B$  means A is the wife of B,  $A \% B$  means A is the father of B and  $A - B$  means A is the brother of B. Which of the following means T is the daughter of P?  
 a)  $P \times Q \% R + S - T$   
 b)  $P \times Q \% R - T + S$   
 c)  $P \times Q \% R + T - S$   
 d)  $P \times Q \% R + S + T$
- Q.29 In a division sum, the divisor is 10 times the quotient and 5 times the remainder. If the remainder is 46, what is the dividend?  
 a) 4236                      b) 4306  
 c) 4336                      d) 5336
- Q.30 A trader has some watches in his stock. He marks his watches 20% above the cost price. He sold half the stock at marked price, one quarter at a discount of 20% on the marked price and rest on discount of 40% on the market price. What is his gain percent?  
 a) 2%                      b) 5%  
 c) 3%                      d) 8%
- Q.31 An article is listed at Rs. 1800 and two successive discounts of 8% and 8% are given on it. How much would the seller gain or loss, if he gives a single discount of 16% instead of two discounts?  
 a) Rs. 11.52 loss                      b) Rs. 11.52 gain  
 c) Rs. 12.62 loss                      d) Rs. 12.52 gain
- Q.32 Two pipes can fill a tank in 20 and 24 min., respectively and a waste pipe can empty 6 gallons per min. All the three pipes working together can fill the tank in 15 min. Find the capacity of the tank (in gallons)?  
 a) 210                      b) 50  
 c) 150                      d) 240
- Q.33 A and B together can complete a piece of work in 8 days while B and C together can do it in 12 days. All three together can complete the work in 6 days. In how much time will A and C together complete the work?  
 a) 8 days                      b) 10 days  
 c) 12 days                      d) 20 days
- Q.34 A worker makes a basket in  $\frac{2}{3}$  of an hour. If he works for  $7\frac{1}{2}$  h, then how many baskets can he make  
 a)  $10\frac{3}{4}$                       b)  $11\frac{1}{4}$   
 c)  $12\frac{1}{2}$                       d) 13
- Q.35 If the length, breadth and the height of a cuboid are in the ratio 6:5:4 and if the total surface area is  $33300\text{ cm}^2$ , then the length, breadth and height in cms, are respectively.  
 a) 90, 85, 60                      b) 85, 75, 60  
 c) 90, 75, 70                      d) 90, 75, 60
- Q.36 The radius of a cylinder is same as that of a sphere. Their volumes are equal. The height of the cylinder is how many times of its radius?  
 a) 1                      b) 2  
 c)  $\frac{2}{3}$                       d)  $\frac{4}{3}$
- Q.37 If the cost of the 12 pencils is equal to the selling price of 10 pencils, the profit percent in the transaction is:  
 a)  $16\frac{2}{3}\%$                       b) 18%  
 c) 20%                      d) 25%
- Q.38 In a queue of children, Kashish is the fifth from the left and Mona is sixth from the right. When they interchange their places among themselves, Kashish becomes thirteenth from the left. Then, what will be Mona's position from the right?  
 a) 4th                      b) 14th

- c) 8th                                      d) 15th
- Q.39 When a plot is sold for Rs. 18,700, the owner loses 15%. At what price must that plot be sold in order to gain 15%?  
a) Rs. 21,000                                      b) Rs. 22,500  
c) Rs. 25,300                                      d) Rs. 25,800
- Q.40 A vendor bought toffees at 6 for a rupee. How many for a rupee must he sell to gain 20%?  
a) 3    b) 4  
c) 5    d) 6
- Q.41 In two alloys, copper and zinc are related in the ratios of 4:1 and 1:3, 10kg of 1st alloy, 16kg of 2nd alloy and some of the pure copper are melted together. An alloy was obtained in which the ratio of the copper to zinc was 3:2. Find the weight of the new alloy.  
a) 34Kg    b) 35Kg  
c) 36Kg    d) 30Kg
- Q.42 A number 15B is divisible by 6. Which of these will be true about the positive integer B?  
a) B will be even                                      b) B will be odd  
c) B will be divisible by 6                                      d) Both A and C
- Q.43 Find the last digit of  $2^{22} \times 3^{33} \times 4^{44} \times 5^{55}$   
a) 2    b) 4  
c) 0    d) 8
- Q.44 What will be the last digit of the multiplication:  $3^{153} \times 7^{162}$ ?  
a) 5    b) 9  
c) 7    d) 6
- Q.45 Find the remainder when  $51^{203}$  is divided by 7.  
a) 4    b) 2  
c) 1    d) 6
- Q.46 Find the remainder when  $75^{80}$  is divided by 7  
a) 4    b) 3  
c) 2    d) 6
- Q.47 In a meet, persons from five different places have assembled in Bangalore High School. From the five places the persons come to represent are 42, 60, 210, 90 and 84. What is the minimum number of rooms that would be required to accommodate so that each room has the same number of occupants and occupants are all from the same places?
- a) 44    b) 62  
c) 81    d) 96
- Q.48 A teacher of 6 students takes 2 of his students at a time to a zoo as often as he can, without taking the same pair of children together more than once. How many times does the teacher go to the zoo?  
a) 10    b) 12  
c) 15    d) 20
- Q.49 In how many ways can 15 people be seated around two round tables with seating capacities of 7 and 8 people?  
a)  $15!/8!$     b)  $7!*8!$   
c)  $^{15}C_8 * 6!*7!$     d)  $^{15}C_8 * 8!$
- Q.50 What is the sum of all even integers between 99 and 301?  
a) 40000    b) 20000  
c) 40400    d) 20200

# End Semester Examination, May 2017

B. Tech.–Sixth Semester

## TOTAL QUALITY MANAGEMENT (HM-623)

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Short questions type:

- Define 'quality costs'.
- List out the basic concepts of total quality management.
- What is customer perception of quality?
- Explain the term: 'performance appraisal'.
- Explain the concept of control charts.
- Define 'quality control and quality assurance'.
- What is 'quality function deployment'?
- What are the seven management tools?
- What are the applications of quality circles?
- How quality auditing is being conducted?

2 × 10

### PART-A

- Q.2 a) Explain the role of senior management in Total Quality Management implementation. 10  
b) What is role of quality council in manufacturing and service sector? 10
- Q.3 a) What is continuous process improvement-Kaizen? 10  
b) What are performance measures-concepts and strategy? 10
- Q.4 Draw a scatter plot of the following data and after determining its degree of correlation, find the line of best fit for predicting the prime lending rate ( $y$ ) from the inflation rate ( $x$ ).

Inflation rate (ordered data ( $x$ ))	Prime lending rate ( $y$ )
3.3	5.2
5.8	6.8
6.2	8
6.5	6.9
8	7
7.6	9
7	10
4	6
9.1	7.9
11	10.8

20

### PART-B

- Q.5 a) What is benchmarking? Explain the benchmarking process in detail. 10  
b) What is Taguchi Quality Loss Function? 10
- Q.6 a) Suggest steps for improving supplier/customer partnerships in managing quality. 10  
b) Explain the concept of quality and organizational culture in detail. 10
- Q.7 What is ISO? Elaborate the steps for successful implementation of ISO in an organization. 20

**End Semester Examination, May 2017**  
**B. Tech.–SeventhSemester**  
**HUMAN RESOURCE MANAGEMENT (HM-822)**

Time: 3 hrs

Max Marks:100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

- Q.1    a) Define 'HRM and role of HR manager'.  
          b) Why managing is important in any organization?  
          c) What are different sources of recruitment?  
          d) Explain the term appraisal and various types.  
          e) What is HR audit?

4x5

**PART-A**

- Q.2    Explain the evolution of HRM and also the various functions of HRM. 20
- Q.3    What is HRP? Explain the various factors which effect HRP. 20
- Q.4    Distinguish between recruitment and selection. Explain the process of selection. 20

**PART-B**

- Q.5    Explain the process of developing and administering the training program in any industry. Which factors affect the training process? 20
- Q.6    What is the difference between performance appraisal and performance management? Which is more comprehensive and why? 20
- Q.7    Write short notes on:  
          a) Role of HR in mergers and acquisitions. 10  
          b) Role of HR in virtual organizations. 10

**End Semester Examination, May 2017**  
**B. Tech.–Seventh Semester**  
**PROJECT MANAGEMENT (HM-823)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Briefly explain the following:

- a) Types of projects.
- b) Problem statement.
- c) Project audits.
- d) Project reviews.
- e) Inventory Management.

4 × 5

**PART-A**

- Q.2 a) What are the management principles applied to various projects? 10  
 b) What are the responsibilities of a project manager? 10
- Q.3 a) What are the sources of project ideas? Also discuss the project approval process in detail. 12  
 b) Why it is necessary to study the feasibility of a project? 8
- Q.4 A project consists of 8 activities. Precedence relation and activity times are given. Draw the network and compute the critical path and show the slack for each activity in a tabular form.

Activity	P	Q	R	S	T	U	V	W
Immediate Predecessor	–	–	–	R	P, Q	T, S	S	U, V
Activity Time (weeks)	12	20	28	12	28	12	8	8

20

**PART-B**

- Q.5 a) Discuss the various team operating rules for successful running of a project work. 10  
 b) Discuss the various practical and legal aspects of project contracts? 10
- Q.6 a) What are the various causes of a project termination? 10  
 b) Why is it necessary to review a project before and after completion? 10
- Q.7 a) What are project inventories? Why does it is essential to keep inventories? 10  
 b) Discuss the strategies used for inventory management in detail. 10



**End Semester Examination, May 2017**  
**B. Tech.–Third Semester**  
**MULTIMEDIA AND ANIMATION(IT-301)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Answer the following questions briefly:

- a) State characteristics of data communication system.
- b) Give advantages and disadvantages of ADSL.
- c) What are various operation modes in JPEG?
- d) Define 'virtual reality'.
- e) Explain the tag IDs that TIFF tags may have.
- f) What is MIDI?
- g) Differentiate between 'hypertext' and 'hypermedia'.
- h) Explain working of OCR.
- i) Explain the role of multimedia in education field.
- j) What is hidden Markov Model?

2x10

**PART-A**

- |     |   |    |
|-----|---|----|
| Q.2 | a) Define 'multimedia servers and databases' in brief.                              | 6  |
|     | b) What is video on demand?   | 4  |
|     | c) What are the design goals of ATM? Explain its layered model in detail.           | 10 |
| Q.3 | a) State differences between bitmap and vector graphics. Which one is better?       | 5  |
|     | b) Explain the working of TIFF file format in brief.                                | 5  |
|     | c) Explain with help of a diagram the working of JPEG predictive lossless encoding. | 10 |
| Q.4 | a) Discuss various applications of multimedia.                                      | 5  |
|     | b) Explain the working of data gloves in detail.                                    | 5  |
|     | c) Explain VEOS system architecture with the help of a neat labeled diagram.        | 10 |

**PART-B**

- |     |   |    |
|-----|---|----|
| Q.5 | a) What do you mean by stereophonic and quadraphonic signal processing?   | 5  |
|     | b) What is speech recognition? What are the various parameters by which speech recognition is characterized? What are the problems associated with it? Also state its components with the help of a diagram.                      | 15 |
| Q.6 | a) How motion estimation and compression is achieved in MPEG? What are the various levels of bit-stream syntax? Explain in detail.  | 10 |
|     | b) How can one generate analog audio from digital audio? Explain in detail.   | 10 |
| Q.7 | a) Define aliasing and anti-aliasing. Explain in detail various types of anti – aliasing. What is use of anti – aliasing filter? Also mention the problems faced while applying anti – aliasing filter along with their solution? | 15 |
|     | b) Explain various animation techniques in detail.  | 5  |

**End Semester Examination, May 2017**  
**B. Tech. — Third/ Fourth Semester**  
**DATA COMMUNICATION AND COMPUTER NETWORKS (IT-401A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) Define 'mesh topology'.
  - b) What do you mean by multiplexing?
  - c) Define 'cryptography'.
  - d) Define 'UDP'.
  - e) What is the basis for membership in a VLAN?
  - f) What is the purpose of hamming code?
  - g) What do you mean by sub-netting?
  - h) Define the term: 'token ring'.
  - i) What is multicast routing?
  - j) Explain Shannon limit.

2 × 10

**PART-A**

- Q.2
- a) Differentiate between simple, half duplex and full duplex with suitable examples. 10
  - b) Explain the synchronous and asynchronous transmission in detail with a suitable diagram. 10
- Q.3
- a) Write a note on 'RS-232 physical layer interface'. 6
  - b) What do you mean by line coding? Explain different types of encodings with examples. 14
- Q.4
- a) Define 'multiplexing'. Explain different types of multiplexing in a computer network. 10
  - b) Explain run length encoding for data compression with an example. 5
  - c) Explain cyclic redundancy check in error correction. 5

**PART-B**

- Q.5
- a) Discuss and state the differences between pure and slotted Aloha. 6
  - b) Explain OSI reference model in detail. 14
- Q.6
- Write short notes on:
- a) Frame relay.
  - b) ATM.
  - c) DQDB.
  - d) Distributed routing.
- 5 × 4
- Q.7
- a) Explain proxy servers in detail. 5
  - b) What is the concept of firewall? How are they installed? Upto what extent they are effective as far as security is concerned? 10
  - c) Write a short note on 'Virtual LAN'. 5

# End Semester Examination, May 2017

## B. Tech. – Fourth Semester JAVA PROGRAMMING (IT-402)

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- Enumerate two situations in which static methods are used.
  - Consider a loan processing system in a bank. Identify the classes and objects in the system and list them.
  - Mention the purpose of the keyword 'final'.
  - What is the significance of an abstract class?
  - What are proxies? How are they advantageous?
  - Differentiate between shallow and deep copy in object cloning.
  - Mention the sub classes of the AWT event class.
  - What do the model, view and controller in a MVC design pattern do?
  - Describe two executors' factory methods.
  - Differentiate between class variable and instance variable. 2 × 10

### PART-A

- Q.2
- Write a program to perform the following functions using classes, objects, constructors and destructors where essential:
    - Get as input the marks of 5 students in 5 subjects.
    - Calculate the total and average.
    - Print the formatted result on the screen. 12
  - Elaborate on the various objects oriented concepts with necessary illustrations. 8
- Q.3
- Write a Java program which creates human face. 8
  - What is a package? How do we design a package in Java? Explain by taking an example. 12
- Q.4
- Write a program to convert the given temperature in Fahrenheit to Celsius using the following conversion formula  $C = (F - 32) / 1.8$  and display the values in tabular form. 10
  - Write down how logging is helpful to Java. 10

### PART-B

- Q.5
- Define 'Multithreading'. Give an example of an application that needs multithreading. 10
  - How to set priorities for threads? Discuss with an appropriate program. 10
- Q.6
- What are the steps involved in establishment of a JDBC connection? 10
  - Create a student table having following attributes (S-Name, S-Roll No., S-Marks (in percentage)). Write a program to select all the students having less than 40% marks. 10
- Q.7
- Explain the steps to create RMI based clients and server. Explain the various methods for registering and gaining access to remote object. 10
  - Explain the reason to implement a corba application with multithreading. 10

**End Semester Examination, May 2017**  
**B. Tech.–Fifth Semester**  
**INTERNET AND WEB TECHNOLOGIES(IT-501)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) Define 'internet'.
  - b) List down the types of network.
  - c) Define 'URL'.
  - d) What is the function of a search engine?
  - e) Differentiate between 'ordered' and 'unordered' lists in HTML.
  - f) What are the advantages of javascript?
  - g) What are hidden fields?
  - h) List down the names of some of the web sources.
  - i) Introduce ASP. Briefly explain the feature of ASP.
  - j) What do you mean by Encryption? 2x10

**PART-A**

- Q.2
- a) Compare OSI model with TCP/IP model. 10
  - b) Explain the structure of e-mail. Also, explain and configure with outlook. How e-mail account is created? 10
- Q.3
- a) What is HTTP? Explain the working of web browser. 10
  - b) Differentiate between 'directories' and 'search engines'. Also, explain what is Meta search engine? 10
- Q.4
- a) Explain absolute and relative links. 5
  - b) Briefly explain the features of XML. 5
  - c) Divide a web page into two horizontal frames. Show a combination of ordered and unordered lists in the upper frame and hyperlinking in the lower frame. 10

**PART-B**

- Q.5
- a) Create various dialog boxes in javascript. 10
  - b) What are events in javascript? Demonstrate event handling with example. 10
- Q.6
- a) Give an example of forms processing using VB script. 10
  - b) Introduce PWS, IIS and apache web servers. 10
- Q.7
- a) Explain the concept of firewall. Why it is used? Explain its various types. 10
  - b) What do you mean by encryption? Explain any two encryption schemes. 10

**End Semester Examination, May 2017**  
**B. Tech.— Seventh Semester**  
**NETWORK PROGRAMMING AND ADMINISTRATION (IT-701)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) Define 'routing'.
  - b) Differentiate between subnet mask, default mask and supernet mask.
  - c) Why IP protocol is called best-effort delivery protocol?
  - d) What do you mean by TCP echo service?
  - e) What do you mean by a socket?
  - f) Name any four trouble shooting commands.
  - g) Compare local procedure call and remote procedure call.
  - h) Define wrappers.
  - i) Differentiate between socket and TLI.
  - j) What is multiservice server?
- 2 × 10

**PART-A**

- Q.2
- a) Write short notes on:
    - i) RIP routing protocol.
    - ii) NAT.

5 × 2
  - b) A company is granted the site address 181.56.0.0 (Class B). The company needs 1000 subnets. Design the subnets. 10
- Q.3
- a) Explain the elementary node and address conversions in the context of TCP and UDP socket. 7
  - b) Explain the types of socket. 3
  - c) Give detailed architecture of TCP based client server communication system. Explain role of each socket call involved with a neat interaction diagram. 10
- Q.4
- a) Define 'iterative connection oriented server'. Compare it with concurrent connection-oriented server. Explain single process, concurrent connection-oriented server algorithm with a neat process structure diagram. 10
  - b) Write short notes on:
    - i) Iterative connectionless server.
    - ii) NFS and its variants: ANFS and SNFS.

5 × 2

**PART-B**

- Q.5
- a) What is the role of dynamic port mapping in RPC? Explain the working of RPC port mapper. 5
  - b) Write short notes on:
    - i) Authentication in RPC.
    - ii) Analogy between RPC of client and server.

5 × 2
  - c) What do you mean by RPC? Also, discuss the RPC model, explaining its retransmission policy? 5
- Q.6
- a) Answer the following:
    - i) What do you mean by a proxy server? 2
    - ii) What is the role of DNS? Give steps for configuring server. 8

b) Write short notes on:

i) PPP.

ii) RADIUS.

5×2

- Q.7 a) Define 'wrappers'. How do they differ from firewall? 5
- b) How can you prevent password cracking? What do you mean by weak and strong password? List out measures to be considered to make your password secure. 5
- c) What do you mean by security planning in a network security? 10

**End Semester Examination, May 2017**  
**B. Tech.–Third / Fifth Semester**  
**SOFTWARE ENGINEERING(IT-702)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1    a) What is quality? Explain the quality control techniques.  
        b) Differentiate between 'unit' and 'integration testing'.  
        c) What is modularity?  
        d) What is functional modeling?  
        e) Explain empirical estimation techniques. 4x5

**PART-A**

- Q.2    a) Explain spiral model in detail along with its advantages and disadvantages. 10  
        b) Write the various applications of software engineering. 5  
        c) Comment on "software doesn't wear out". 5
- Q.3    a) Explain control flow model with example 5  
        b) What is requirement engineering? Explain various steps in requirement engineering. 10  
        c) What is behavioral modeling? 5
- Q.4    a) Explain how project scheduling and tracking is done. 10  
        b) What is risk? Explain various risk management techniques. 10

**PART-B**

- Q.5    a) What is functional independence? Explain various types of coupling techniques. 10  
        b) Explain structural partitioning, control hierarchy, information tiding and data structures used in system design. 10
- Q.6    a) What is test case? What are the characteristics of a good test case? Also, draw its template. 10  
        b) Differentiate between:  
           i) Alpha and Beta testing.  
           ii) Verification and validation testing. 10
- Q.7    a) What is software reliability? What are the different measures of software reliability? 10  
        b) What is CASE? Explain its architecture. 10

**End Semester Examination, May 2017**  
**B. Tech.—Sixth / Seventh Semester**  
**MANAGEMENT INFORMATION SYSTEM (IT-721)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) What is the need of automated MIS? Discuss.
  - b) What are advantages and disadvantages of MIS?
  - c) What is the importance of good information? Discuss.
  - d) Clearly explain design of MIS as a system.
  - e) Explain different components of MIS.
- 4 × 5

**PART-A**

- Q.2
- a) Explain different organizational sector using MIS. Also, explain their functional models with examples. 10
  - b) Explain role of DBMS, data warehouse and data mining in MIS. 10
- Q.3
- a) What should be the long range plan of MIS? Explain. 10
  - b) With the help of suitable example, explain MIS software and MIS team in detail. 10
- Q.4 Write short notes on:
- a) Customization of MIS software for the organization. 10
  - b) General model of information processing. 10

**PART-B**

- Q.5
- a) What do you understand by the term decision making? Explain the concept of decision support system (DSS). 10
  - b) Discuss different DSS models, also clearly explain their working. 10
- Q.6
- a) Differentiate between 'enterprise business system' and 'supply chain management system'. 10
  - b) What are various activities of service sector? Why these activities of service sector implemented in MIS. 10
- Q.7
- a) What are ethical and societal challenges of IT? Explain. 10
  - b) How could you assure the security of management of information system? Discuss. 10



# End Semester Examination, May 2017

## B. Tech.— Sixth Semester E-COMMERCE AND ERP (IT-722)

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- Impact of emergence of E-commerce. Comment on it.
  - Define social network marketing.
  - Explain importance of ERP in E-business era.
  - Define knowledge engineering.
  - Define the role of E-strategy in E-commerce.
  - What are the advantages of ERP?
  - What are the disadvantages of ERP?
  - How ERP is different from SAP?
  - Define the role of E-cash in managing ERP business.
  - How Tele-marketing helps in facilitation of ERP business?
- 2 × 10

### PART-A

- Q.2
- Define and explain the transactional model of ERP with example. 10
  - What are the 4C's of E-commerce? Explain with example. 10
- Q.3
- Explain cyber cash model with a neat diagram. 10
  - Write short notes on:
    - E-commerce servers.
    - Digital payments systems. 5 × 2
- Q.4
- Write short notes on:
    - Digital certificates.
    - Cryptography. 5 × 2
  - What are the different payments methods used for E-commerce? Also, what kind of threats and protection methods are associated with it. 10

### PART-B

- Q.5 Explain the role of ERP in managing SCM. What are the basic features and capabilities of ERP? 20
- Q.6
- Explain the different modules of ERP in detail. 10
  - Write short notes on:
    - Product planning.
    - Resource management in global scenario. 5 × 2
- Q.7
- Explain ERP life cycle model with a neat diagram. 10
  - ERP is an integrated system. Comment on it. 10

**End Semester Examination, May 2017**  
**B. Tech.–Sixth / Seventh Semester**  
**ADVANCED JAVA PROGRAMMING(IT-801)**

Time: 3 hrs.

Max Marks:100

No. of pages:1

Note: *Attempt FIVE questions in all;Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1    a) Explain different JDBC drivers.  
        b) What is the use of half close sockets?  
        c) What is byte code verification?  
        d) Explain the differences between URL and URI. 5 × 4

**PART-A**

- Q.2    a) Write a program in Java to store a student information in database. 10  
        b) Describe LDAP and write the steps to configure an LDAP server. 10
- Q.3    a) Write a program using sockets to receive message from server. 10  
        b) Write a program to print protocol port host and fill component of a URL. 10
- Q.4    a) What are component organizers? Write a program to implement list. 10  
        b) Describe various styled text components. 10

**PART-B**

- Q.5    a) Explain:  
        i) Clipping.  
        ii) Rendering. 5 × 2  
        b) How printing is done using AWT component in Java? Explain with the help of an example. 10
- Q.6    What is BeanWriting process? Explain in detail with example. Explain different types of bean properties. 20
- Q.7    What are class loaders? Explain encryption techniques and digital signature,for security implementation. 20

**End Semester Examination, May 2017**  
**B. Tech.–Seventh / Eighth Semester**  
**SOFTWARE PROJECT MANAGEMENT (IT-821)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) What is KPA's project management?
  - b) What is software testing plan?
  - c) What are software development life cycle (SDLC) models?
  - d) What is estimation scheduling?
  - e) Define 'configuration management process'.
  - f) What is milestone list?
  - g) What is network analysis?
  - h) Explain the role of pareto chart for software development estimation.
  - i) What is quality management planning?
  - j) What is critical change management? 2 × 10

**PART-A**

- Q.2
- a) List and explain the various activities covered by software project management. 10
  - b) What do you understand by CMM model? Explain in detail. 10
- Q.3
- a) Explain the significance of spiral model along with its advantages and disadvantages in detail. 10
  - b) Explain the following:
    - i) Software Testing Plan.
    - ii) Prototype Model. 5 × 2
- Q.4
- a) What is effort estimation? Explain it with the help of PERT scheduling. 10
  - b) What is software requirement specification? Explain it in context of project planning. 10

**PART-B**

- Q.5
- a) What is risk management? Also explain risk assessment and control in detail. 10
  - b) Explain the following:
    - i) Quality Assurance and Control.
    - ii) Defect Prevention Planning. 5 × 2
- Q.6
- a) What is schedule management? Also explain project crashing and fast tracking in detail. 10
  - b) Explain the following:
    - i) Flexibility matrix.
    - ii) Scope Management. 5 × 2
- Q.7
- a) What do you understand by quality control tools? Explain it with the help of process flow chart and run chart. 10
  - b) What is review plan? Also explain defect analysis and prevention techniques in software testing in detail. 10

**End Semester Examination, May 2017**  
**B. Tech.–Seventh Semester**  
**DATA WAREHOUSING AND DATA MINING (IT-822)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

- Q.1
- a) Differentiate between data, information and knowledge.
  - b) Explain distributed data warehouse.
  - c) Explain tuning and testing of data warehouse.
  - d) Explain association rule with an example.
  - e) Describe the types of concept hierarchy.
  - f) What are the advantages of OLAP over OLTP?
  - g) Differentiate between 'classification' and 'clustering'.
  - h) What is the significance of meta data in data warehouse?
  - i) Explain data mining.
  - j) What are the benefits of data mining? 2 × 10

**PART-A**

- Q.2
- a) Differentiate between DBMS and data warehouse. 7
  - b) Explain star and fact constellation schema. 6
  - c) Explain various models of OLAP. 7
- Q.3
- a) Explain the three-tier architecture of data warehouse. Describe with a neat diagram. 10
  - b) Give types of OLAP servers and differentiate between them. 10
- Q.4
- a) How are top-down and bottom-up approaches for building a data warehouse different? Discuss the merits and demerits of each. 10
  - b) Explain data smoothing techniques in detail. 10

**PART-B**

- Q.5
- a) Write short notes on:
    - i) Market Basket Analysis.
    - ii) Data Mining Tools. 5 × 2
  - b) How is clustering different from classification? What are outliers? How clustering helps outliers? 10
- Q.6
- a) Explain the following in detail:
    - i) BIRCH clustering.
    - ii) CURE clustering. 5 × 2
  - b) Explain the different partition methods in detail. 10
- Q.7
- a) Describe some applications of classification and clustering for multimedia documents. 10
  - b) Write short notes on:
    - i) Mining Complex Data Objects.
    - ii) Mining Text Databases. 5 × 2

**End Semester Examination, May 2017**  
**B. Tech.–First/ Second Semester**  
**ELEMENTS OF MECHANICAL ENGINEERING(M-101C)**

Time: 3 hrs

Max Marks:100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

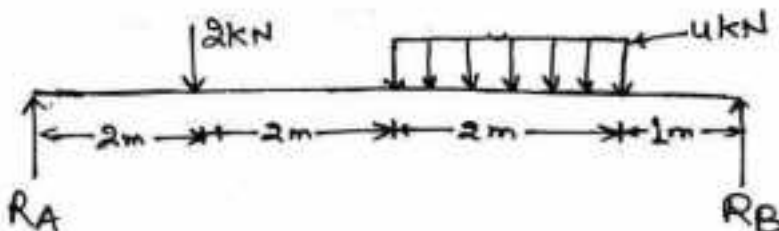
- Q.1
- Define a thermodynamic system in detail.
  - Define 'zeroth law of thermodynamics'.
  - Differentiate between 'spur gear' and 'helical gear'.
  - Define 'spark plug and injector'.
  - What is the angle of lap in belt?
  - What is stress?
  - Write down carbon percentage for steel and cast iron.
  - Define 'velocity ratio'.
  - Define 'Hook's law'.
  - Define 'hardness and toughness'.
- 2x10

**PART-A**

- Q.2
- Write down the corollaries of first law of thermodynamics. 10
  - Explain the functional difference between a heat pump and refrigerator. 10
- Q.3
- Explain the working of four stroke diesel engine with the help of line diagrams. 12
  - Write down the different types of refrigerant used in refrigerator. 8
- Q.4
- What is the chain drive? Briefly discuss the various types of chains with diagrams. 12
  - Explain the reverted gear train and epicyclic gear train. 8

**PART-B**

- Q.5
- Derive the relation between E, K and C. 12
  - Draw the stress-strain curve and also explain it in details 8
- Q.6 Draw the shear force and bending moment diagram for the following system.



- Q.7
- Define 'steel'. Classify the plain carbon steel and discuss its application too. 10
  - What is resistance welding? How it is performed? Also write the various types of resistance welding. 10

**End Semester Examination, May 2017**  
**B. Tech.–Second Semester**  
**APPLIED MECHANICS (M-201A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

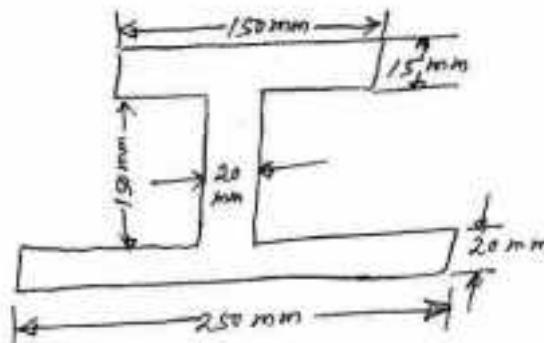
Q.1 Answer the following question:

- a) What is concept of rigid body in engineering mechanics?
- b) State the varignon's principle of moments.
- c) Distinguish between centre of gravity and centroid.
- d) Write "Perpendicular axis theorem".
- e) Name different force systems.
- f) What is projectile? Give the equation of parabolic path.
- g) Write general plane motion with suitable example.
- h) Write work-energy relation with suitable example.
- i) What is impulse?
- j) State the principle of virtual work.

2 × 10

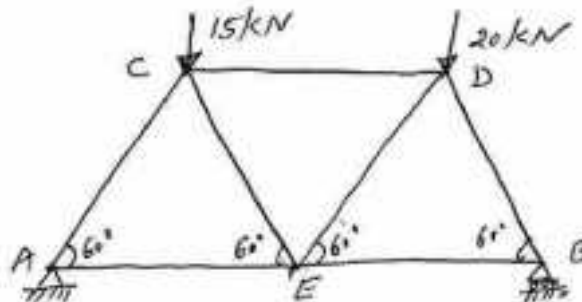
**PART-A**

- Q.2 a) Explain static and dynamic concept of applied mechanics. 10  
 b) Determine the magnitude of two forces such that if they act at a right angles, their resultant is  $\sqrt{10}kN$  and when they act at an angle of  $60^\circ$ , their resultant is  $\sqrt{13}kN$ . 10
- Q.3 a) Explain parallel axis theorem with suitable example. 6  
 b) Find the moment of inertia of the following figure about centroidal axis  $xx$  and  $yy$ .



14

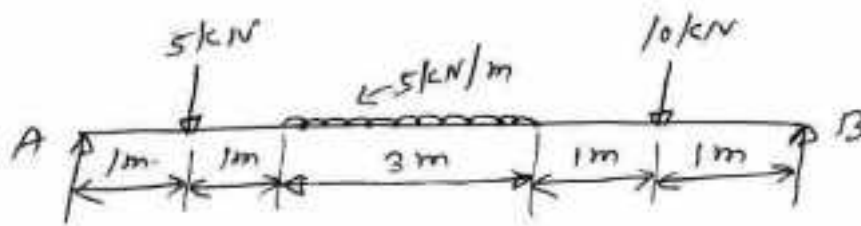
- Q.4 a) Differentiate between "method of joints" and "method of sections". 5  
 b) Calculate the magnitude and nature of forces in all the members of the given truss. All members are of length 3m in the given figure.



15

**PART-B**

- Q.5 a) Derive an expression for the maximum height and range of a projectile traversed by a stone thrown with an initial velocity of  $u$  and an inclination of  $\phi$ . 8
- b) A stone is thrown vertically upwards from the ground with a velocity 50 m/s. After 5 seconds, another stone is thrown vertically upwards from the same place. If both the stone strikes the ground at the same time, find the velocity with which the second stone was thrown upwards. 12
- Q.6 a) Explain the concept of Instantaneous centre of rotation with neat diagram. 6
- b) A 40 ton rail car travels at 4 km/hr. and collides with a 100 ton wagon on the same track, moving in the opposite direction at 1.2 km/hr. Find their velocities immediately after impact assuming no loss of energy, what is the impulse between them? 14
- Q.7 a) Calculate the reactions at A and B by the method of "Virtual work" in the given figure.



- b) Differentiate between "translation and rotation" with suitable diagrams. 5

**End Semester Examination, May 2017**  
**B. Tech.–Second Semester**  
**ENGINEERING MATERIALS AND HEAT TREATMENT (M-202)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) Write the area of application of heat resistant steel.
  - b) What is the effect of adding Copper to Aluminium?
  - c) Write properties and uses of bearing material.
  - d) Differentiate between Brass and Bronze.
  - e) Define mechanical behaviour of ceramic.
  - f) What is hardness?
  - g) What are the properties of refractory material?
  - h) What is the reason of corrosion?
  - i) Why is annealing done?
  - j) Write down the names of various quenching media. 2 × 10

**PART-A**

- Q.2
- a) What are the classifications of engineering materials? Explain them briefly. 10
  - b) Write the composition and area of application of the following:
    - i) High carbon steel.
    - ii) Silicon steel.
    - iii) Bearing materials.
    - iv) Spring steel.
    - v) Aluminium. 2 × 5
- Q.3 Write short notes on:
- a) Composite material.
  - b) Glass ceramic.
  - c) Piezoelectric ceramic.
  - d) Abrasive material. 5 × 4
- Q.4
- a) Draw and explain typical 'creep-test' curve, showing different stages of elongation for a long time high temperature creep-test. 10
  - b) Discuss the procedure of hardness testing and advantages of hardness test in detail. 10

**PART-B**

- Q.5
- a) What is the difference between an iron-carbon diagram and a T-T-T diagram? 10
  - b) Under what-condition do the pearlite and bainite transformation takes place? 10
- Q.6
- a) What do you understand by overheating and burning of steel? Discuss in detail. 10
  - b) What is the mechanism of heat removal during quenching? Explain all quenching media in detail. 10
- Q.7
- a) Discuss the mechanism by which the carbon content of the surface of a steel is increased in the carburizing process. 10
  - b) Write short notes on:
    - i) Induction hardening.
    - ii) Cyaniding and carbonitriding. 5 × 2



**End Semester Examination, May 2017**  
**B. Tech.–Third Semester**  
**ENGINEERING MECHANICS (M-301A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.

Q.1 Briefly explain:

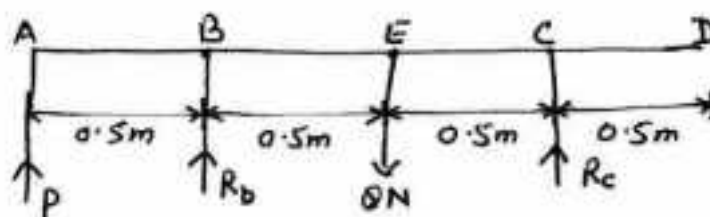
- State the difference between equilibrium and resultant.
- Explain parallelogram law of forces.
- Prove Lami's theorem.
- What is a difference between 'moment' and 'couple'?
- What is the difference between 'plane frame' and 'space frame'?
- What is meant by relative motion?
- Define 'force and impulse'.
- Define 'stable and unstable equilibrium'.

2½ × 8

**PART-A**

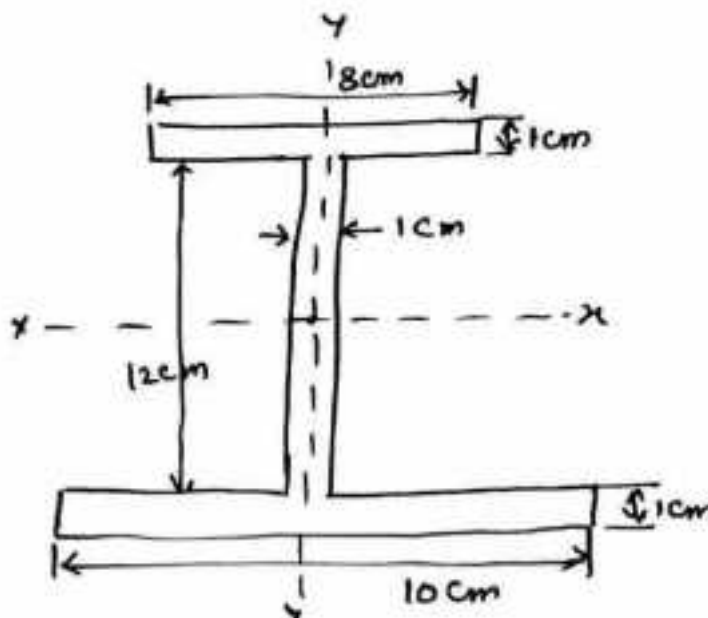
Q.2 Find the resultant of force  $2, \sqrt{3}, 5, \sqrt{3}$  and  $2N$  that act at an angular point of a regular hexagon toward the other angular points taken in order. 20

- Q.3 a) Outline the steps involved while making an analysis of a simple truss by the i) method of joints and ii) methods of section. 10
- b) A uniform rod ABCD weighs 8 N and is supported at B and C as shown in the figure. Determine the minimum force at A which will just over turn the rod.



10

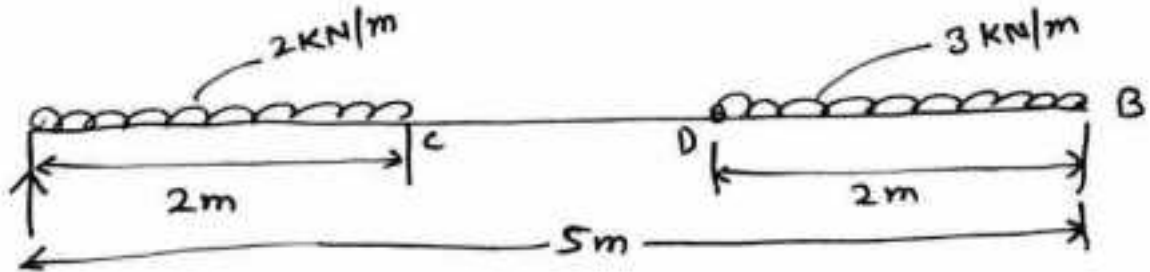
Q.4 Determine the polar moment of inertia of the I-section as shown in the figure.



20

**PART-B**

- Q.5 A stone is dropped from the top of a tower 40 m height. At the same instant, another stone is thrown upward from the foot of tower with an initial velocity of 20 m/s. At what distance from the top and after how much time the two stones cross each other. 20
- Q.6 a) Write the impulse-momentum equation and mention its application. 12  
b) State the principle of work and energy. 8
- Q.7 A beam of span 5 m is supported at A and B and is subjected to a load system shown in the figure. Using the principle of virtual work, find reaction at A and B.



20

**End Semester Examination, May 2017**  
**B. Tech.– Third Semester**  
**THERMAL ENGINEERING-I (M-302)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Briefly answer:

- a) Define 'heterogeneous' and 'homogeneous system'.
- b) Define 'quasistatic process' and 'adiabatic process'.
- c) What is the steady flow process?
- d) What are the limitations of 1<sup>st</sup> law of thermodynamics?
- e) Define the 'perpetual motion machine of the first kind'.
- f) Define 'two similarities of heat and work'.
- g) Distinguish between proximate analysis and ultimate analysis.
- h) Write the expression for the Gibbs function.
- i) Define the 'flash point' and 'pourpoint' for liquid fuel.
- j) What do you mean by 'superheated steam'?

2 × 10

**PART-A**

- Q.2 a) Define microscopic approach, macroscopic approach, enthalpy and internal energy of a substance. 10
- b) Define the intensive, extensive and specific properties with examples. 10

- Q.3 a) i) Define 'irreversible process'.
- ii) Define 'Clausius inequality'.
- iii) Define 'specific heat and heat capacity'.
- iv) Define 'concept of continuum'.
- v) Define 'perpetual motion machine of second kind'. 2 × 5
- b) The 150 kJ of work is supplied to a system and the pressure volume correlation for the non-flow quasi-static process is given by  $p = (8 - 4V)$  bar, where V is in  $m^3$ . Determine the final pressure and volume of the system. Take the initial volume  $= 0.6 m^3$ . 10

- Q.4 a) What are processes involved in a Carnot cycle? Determine an expression for the thermal efficiency of a Carnot cycle. Why the Carnot cycle is impracticable? 10
- b) Find out the specific volume of steam when its pressure is 7 bar when the condition of steam is i) wet having dryness fraction 0.9, ii) dry, and iii) superheated, the temperature of steam being  $250^\circ C$ . Use the volume of 1 kg of water as 1 litre, specific volume of water as  $0.001 m^3 / kg$ , specific volume of dry steam  $0.2729 m^3 / kg$  and the concept of volume of dry steam (= specific volume of wet steam volume of water in suspension). 10

**PART-B**

- Q.5 a) Describe briefly with the sketch, the constructional and operational aspects of a bomb calorimeter system used to experimentally determine the calorific value of a sample of coal. How the result is calculated from the data obtained? 10

- b) What are the characteristics of an ideal fuel? Describe primary and secondary fuels. Define the 'excess air' term used for combustion in a fossil fuel fired thermal system. 10
- Q.6 a) A cyclic heat engine operation between a source temperature of  $1000^{\circ}\text{C}$  and a sink temperature of  $40^{\circ}\text{C}$ . Find out the least rate of heat rejection per kW net output of the engine. Make a figure showing source, sink and work output. 10
- b) Prove that the entropy is constant. Derive an expression for the entropy change in an irreversible process. 10
- Q.7 a) State the Kelvin-Planck and Clausius statement of the second law of thermodynamics. Prove the equivalence between them. 8
- b) Define the available energy and unavailable energy. When does the system becomes dead? 7
- c) How does an ideal gas differ from a perfect gas? 5

**End Semester Examination, May 2017**  
**B.Tech-Third Semester**  
**MANUFACTURING TECHNOLOGY-I (M-303A)**

Time: 3 hrs

Max Marks:100

No. of pages: 1

Note: *Attempt any FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from part-A and TWO questions from part-B. Each question carries equal marks.*

- Q.1
- a) What do you mean by dry and green sand?
  - b) What are the main constituents of moulding sand?
  - c) What are the functions of riser?
  - d) What is hot working and cold working?
  - e) What is meant by term forging?
  - f) What is wire drawing?
  - g) State the principle of rolling.
  - h) Differentiate between 'carburizing flame' and 'oxidizing flame'.
  - i) Why is the coating of electrode done?
  - j) What is brazing?
- 2x10

**PART-A**

- Q.2
- a) Explain the procedure of making a mould using split pattern. 10
  - b) What are the common allowances provided to the pattern? 5
  - c) What is core? What are its uses? 5
- Q.3
- a) Sketch and explain the construction and operation of a hot chamber die casting machine. 10
  - b) What are the causes and remedies of the following casting defects?
    - i) Blow holes
    - ii) Hot tears. 5
  - c) Explain in brief the cleaning of casting. 5
- Q.4
- a) What are the different types of forging? Explain drop forging and press forging. 10
  - b) Sketch and explain tube drawing. 5
  - c) Sketch and explain direct extrusion. 5

**PART-B**

- Q.5
- a) Sketch and explain the following press tools:
    - i) Progressive die.
    - ii) Compound die. 5x2
  - b) Sketch and explain stretch forming. 5
  - c) Explain bending and coining. 5
- Q.6
- a) What do you understand by term edge preparation in welding? Sketch different types of edges prepared for welding. 10
  - b) Explain the construction and operation of oxy-acetylene welding. 10
- Q.7
- a) Explain TIG welding with its application. 10
  - b) Explain submerged arc welding with its applications. 10

## End Semester Examination, May 2017

### B. Tech.– Third/ Fourth Semester FLUID MECHANICS(M-304A)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q. 1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1
- What is Newton's law of viscosity?
  - Define the term 'meta-centre'.
  - What is hydrostatic law?
  - Define 'uniform' and 'non-uniform flow'.
  - What is venturimeter?
  - Define 'impulse momentum relationship'.
  - What is Hagen poiseuille's formula?
  - What factors decides the type of flow in pipes?
  - Define 'hydraulic gradient line'.
  - What do you mean by major energy loss in pipes?
- 2x10

#### PART-A

- Q.2
- Define 'surface tension. Prove that the relationship between surface tension and pressure inside a droplet of liquid in excess of outside pressure is given by  $p = \frac{4\sigma}{d}$ .  
10
  - A circular plate 3.0 m diameter is immersed in water in such a way that its greatest and least depth below the free surface are 4 m and 1.5 m respectively. Determine the total pressure on one face of the plate and position of the centre of pressure. 10
- Q.3
- State different types of fluid flow. Explain any two in detail. 10
  - The velocity potential function ( $\phi$ ) is given by an expression:  

$$\phi = -\frac{xy^3}{3} - x^2 + \frac{x^3y}{3} + y^2$$
    - Find the velocity components in  $x$  and  $y$  direction.
    - Show that  $\phi$  represents a possible case of flow. 10
- Q.4
- Derive an expression for the discharge through a venturimeter. 10
  - A pipe line carrying oil of specific gravity 0.87, changes in diameter from 200 mm diameter at a position A to 500 mm diameter at a position B which is 4 metres at a higher level. If the pressures at A and B are  $9.81 \text{ N/cm}^2$  and  $5.886 \text{ N/cm}^2$ , respectively and the discharge is 200 litres/sec, determine the loss of head and direction of flow. 10

#### PART-B

- Q.5
- Determine i) the pressure gradient ii) the shear stress at the two horizontal parallel plates and iii) the discharge per metre width for the laminar flow of oil with a maximum velocity of 2 m/s between two horizontal parallel fixed plates which are 100 mm apart. Given  $\mu = 2.4525 \text{ NS/m}^2$ . 10
  - Define the terms: kinetic energy correction factor and momentum correction factor. 10

- Q.6 a) Obtain an expression for the co-efficient of friction in the terms of shear stress. 10  
 b) Define the terms:  
 i) Boundary layer.  
 ii) Boundary layer thickness.  
 iii) Drag.  
 iv) Lift.  
 v) Momentum thickness. 2x5

- Q.7 a) Three pipes of lengths 800 m, 500 m and 400 m and of diameters 500 mm, 400 mm and 300 mm respectively are connected in series. These pipes are to be replaced by a single pipe of length 1700 m. Find the diameter of the single pipe. 10  
 b) The frictional torque  $T$  of a disc of diameter  $D$  rotating at a speed  $N$  in a fluid of viscosity  $\mu$  and density  $\rho$  in a turbulent flow is given by:

$$T = D^5 N^2 \rho \phi \left[ \frac{\mu}{D^2 N \rho} \right]$$

Prove this by the method of dimensions.

10

**End Semester Examination, May 2017**  
**B.Tech-Third Semester**  
**MATERIAL SCIENCE (M-305)**

Time: 3 hrs

Max Marks:100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) Name different types of crystal imperfection.
  - b) Define 'Atomic Packing Factor (APF)'.
  - c) Write Gibb's phase rule.
  - d) What do you mean by solid solutions?
  - e) Write the name of different heat treatment process.
  - f) What is plastic deformation?
  - g) Write the factors affecting fatigue phenomenon.
  - h) What is creep mechanism?
  - i) How polymers are formed?
  - j) Write properties of ceramics.

2x10

**PART-A**

- Q.2
- a) Define space lattice, crystal planes and crystal direction. How are crystallographic planes indicated in HCP unit cells? 10
  - b) Explain different types crystal imperfections. What are the effects of imperfections on metal properties? 10
- Q.3
- a) What are single and multiphase solid solutions? Write the importance and objectives of phase diagram. 10
  - b) Draw TTT diagram and explain in brief. 10
- Q.4
- a) What is heat treatment? What are the methods of heat treatment process? Explain normalizing heat treatment process. 10
  - b) Explain the properties of ferrite and martensite. 10

**PART-B**

- Q.5
- a) What is elastic deformation? Differentiate between 'conventional' and 'true stress-strain curves' for polycrystalline materials. 10
  - b) Explain the mechanism of fatigue phenomenon. 10
- Q.6
- a) What is creep? Describe the impact of time and temperature on creep. 10
  - b) What is corrosion phenomenon? Write the mechanism and effect of corrosion. 10
- Q.7
- a) Explain reinforced particles-strengthened and dispersion strengthened composites. 10
  - b) Classify ceramic materials. Explain ceramic forming techniques. 10



**End Semester Examination, May 2017**  
**B. Tech.–Third Semester**  
**MATERIALS AND HEAT TREATMENT(M-307)**

Time: 3 hrs

Max Marks:100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.*

- Q.1
- a) What do you mean by flame hardening?
  - b) What is cyaniding in heat treatment?
  - c) Name possible defects during heat treatment.
  - d) What do you understand by isothermal transformation?
  - e) Why tempering is done on materials?
  - f) Define creep phenomenon.
  - g) What is chemical bonded ceramic?
  - h) Name different types of glasses?
  - i) Write the composition and properties of bearing materials.
  - j) What is free cutting steels? 2x10

**PART-A**

- Q.2
- a) Classify engineering materials. What are different types of cast iron? Explain the properties of any one. 10
  - b) Name different non – ferrous materials. Write the properties, advantages and limitations of any two non – ferrous materials. 10
- Q.3
- a) What are composite materials? Classify composite materials. Write the properties of composite materials. 10
  - b) Name advanced ceramic materials and explain either piezoelectric ceramic or, ceramic ball bearing. 10
- Q.4
- a) What do you mean by mechanical failure of materials? Explain the fatigue failure phenomenon. 10
  - b) What different types of mechanical tests are conducted on a material? Explain tensile test process. 10

**PART-B**

- Q.5
- a) Explain the principle of heat treatment of steel. How martensite formation takes place during phase transformation? 10
  - b) What is alloy? Explain the effect of alloying element on a material. 10
- Q.6
- a) Name various heat treatment processes. Explain any one heat treatment process in detail. 10
  - b) Explain the mechanism of heat removal during quenching process. 10
- Q.7
- a) Explain in detail the chemical heat treatment process. 10
  - b) What is surface hardening? Why surface hardening is done? Explain with a suitable example. 10

## End Semester Examination, May 2017

### B. Tech.–Third Semester METROLOGY(M-308)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1
- a) What are different grades of slip gauges?
  - b) What is hole basis system?
  - c) What is international prototype meter?
  - d) What is mean by selective assembly?
  - e) What is 'best size' wire?
  - f) State the principle of auto collimator.
  - g) What is primary texture and secondary texture?
  - h) Name commonly used method of measuring straightness.
  - i) Name the various types of pitch errors found in screw thread.
  - j) Define circular pitch, diametral pitch and module of a gear.
- 2x10

### PART-A

- Q.2
- a) Explain Taylor's principle of limit gauging 5
  - b) Determine the dimensions, tolerances and allowances for 24 mm hole and shaft pair designated as H7d<sub>8</sub>.  
Given:-
    - (i) Upper deviation of shaft 'd' =  $-16D^{0.44}$
    - (ii) 24mm lies in the diameter steps of 18mm to 30mm.
    - (iii) IT7 = 16i
    - (iv) IT8 = 25i15
- Q.3
- a) What is comparator? State the use of comparator. 5
  - b) Describe the working principle of an electrical comparator with a neat sketch. 15
- Q.4
- a) Define the following:
    - (i) Ra – Value
    - (ii) Rq – Value
    - (iii) Rz – Value
    - (iv) Sampling length
    - (v) Lay5
  - b) Describe the working principle and operation of a Taylor – Hobson – Talysurf roughness instrument for measurement of surface roughness. 15

### PART-B

- Q.5
- a) Name the important elements of a screw thread are required to be measured. 5
  - b) Explain with a sketch the three – wire method for measuring effective diameter of an external thread. 15
- Q.6
- a) Define 'circularity error'. 5
  - b) Describe in detail the V-block and dial indicator method of testing roundness. 15
- Q.7
- a) Name the various elements of a spur gear which are checked for accuracy. 5
  - b) Describe the working principle of Parkinson gear tester and state its limitations. 15

**End Semester Examination, May 2017**  
**B. Tech.–Fourth Semester**  
**THERMAL ENGINEERING-II (M-401A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- Write down the two basis difference between SI engine and CI engine.
  - What do you mean by mean effective pressure?
  - Draw the P-V and T-S diagram of Dual cycle.
  - Mention the various types of gasoline injection system.
  - Name the various types of sensor used in electronic fuel injection system.
  - Draw the P-h and T-S diagram of vapour compression cycle.
  - Deduce the designation of following refrigerants:  $H_2O$ ,  $CHClF_2$ .
  - What do you mean by relative humidity and dry bulb temperature?
  - List the types of refrigerating compressor.
  - What is sensible heating and humidification process? 2 × 10

**PART-A**

- Q.2
- Obtain an expression for efficiency of an Otto cycle. 10
  - In an engine working on Diesel cycle inlet pressure and temperature are 1 bar and  $17^\circ\text{C}$ , respectively. Pressure at the end of adiabatic compression is 35 bar. The ratio of expansion i.e. after constant pressure heat addition is 5. Calculate the heat addition, heat rejection and efficiency of the cycle. Assume  $\gamma = 1.4$ ,  $C_p = 1.004$  kJ/kgK and  $C_v = 0.717$  kJ/kgK. 10
- Q.3
- Explain the following with neat sketch:
    - Individual pump and nozzle system.
    - Distributor system. 5 × 2
  - Describe briefly the MPFI system with neat sketch. 10
- Q.4
- Briefly explain the stages of combustion in SI engines elaborating the flame front propagation. 10
  - Explain the phenomenon of knock in CI engine and write the factors which affect it. 10

**PART-B**

- Q.5
- A refrigerator works between  $-7^\circ\text{C}$  and  $27^\circ\text{C}$ . The vapour is dry saturated at the end of adiabatic compression. Determine
    - Coefficient of performance.
    - Power of compressor to remove 180 kJ/min.

Temp ( $^\circ\text{C}$ )	Enthalpy (kJ/kg)		Entropy (kJ/kg K)	
	Liquid ( $h_f$ )	Latent ( $h_{fg}$ )	Liquid ( $s_f$ )	Vapour ( $s_g$ )
-7	-30	1298	-0.108	4.75
27	115	1173	427	4.33

10

b) Derive an expression for C.O.P. for a system working on Bell-Coleman cycle. 10

Q.6 a) A mixture of dry air and water vapour is at a temperature of  $22^{\circ}\text{C}$  under a total pressure of 0.9732 bar and the dew point temperature is  $15^{\circ}\text{C}$  find:  
i) Partial pressure of vapour.  
ii) Enthalpy of air per kg of dry air.  
iii) Relative humidity. 10

b) Define the following terms:  
i) Specific humidity.  
ii) Saturated air.  
iii) Saturation ratio.  
iv) Dry bulb temperature.  $2\frac{1}{2} \times 2$

Q.7 Explain the following with neat sketch.

a) Forced-air circulation condensers.  
b) Vane type rotary compressor.  
c) Dry expansion evaporator.  
d) Automatic expansion valve.  $5 \times 4$

**End Semester Examination, May 2017**  
**B. Tech.–Fourth/ Fifth Semester**  
**FLUID MACHINES AND TURBOMACHINERY (M-402A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- Define the term: FREE JET.
  - Differentiate between force exerted by a jet of water striking on a fixed vertical plate and moving vertical plate.
  - Differentiate between turbines and pumps.
  - What do you mean by Gross Head and Net Head?
  - Define unit discharge, unit speed and unit power.
  - Define the term: degree of reaction as applied to hydraulic turbines.
  - What is priming of centrifugal pumps.
  - What is negative slip in a reciprocating pump? Also mention the conditions.
  - Differentiate between single acting and double acting reciprocating pump.
  - Define the term: hydraulic accumulator. 2 × 10

**PART-A**

- Q.2
- A jet of water of diameter 75 mm moving with a velocity of 25 m/s, strikes a fixed plate inclined at an angle of  $60^\circ$  with the direction of motion of jet. Find the force exerted by the jet on the plate:
    - In the direction normal to the plate.
    - In the direction of jet. 10
  - A small ship is fitted with jets of total area  $0.65\text{m}^2$ . The velocity through the jet is 9 m/s and speed of the ship is 18 km/hr. The efficiencies of the engine and pump are 85% and 65% respectively. If the water is taken amid ships, determine the propelling force and overall efficiency, assuming pipe losses to be 10% of kinetic energy of the jets. 10
- Q.3
- Explain with neat sketch governing of Pelton Turbine. 10
  - A single jet pelton wheel runs at 300 rpm under a head of 510 m. The jet diameter is 200 mm and is deflected by an angle of  $165^\circ$ . The relative velocity is reduced by 15% due to friction. Find:
    - Shaft power considering 3% mechanical losses.
    - Overall efficiency.
 Assume  $C_v = 0.98$  and  $K_u = 0.46$ . 10
- Q.4
- Briefly explain the characteristic curves of reaction turbine. 6
  - With the help of neat sketch, explain the constructional details of Kaplan turbine. 8
  - A turbine is to operate under a head of 25m at 200 rpm. The discharge is  $9\text{m}^3/\text{s}$ . If the efficiency is 90%, determine the power, speed and discharge for the turbine under a head of 20 m. 6

**PART-B**

- Q.5
- Derive an expression for minimum starting speed of a centrifugal pump. 10

- b) A centrifugal pump rotating at 1000 rpm delivers 160 liters/second of water against a head of 30 m. The pump is installed at a place where atmospheric pressure is  $1 \times 10^5$  pa. (abs) and vapour pressure of water is 3 KPa (abs). The head loss in suction pipe is equivalent to 0.2 m of water. Calculate:
- Minimum NPSH
  - Maximum allowable height of the pump from free surface of water in the sump. 10

- Q.6 a) What is indicator diagram and explain the effect of acceleration and friction in suction and delivery pipe on indicator diagram. 10
- b) The piston area of a single acting reciprocating pump is  $0.15 \text{ m}^2$  and stroke length is 30 cm. The water is lifted through a total head of 15 m. The area of delivery pipe is  $0.03 \text{ m}^2$ . If the pump is running at 50 rpm, find:
- Percentage slip.
  - Coefficient of discharge.
  - Power required to drive the pump.
- The actual discharge is 35 litres/second. Assume mechanical efficiency = 85%. 10

- Q.7 Explain with a neat sketch the constructional details and working of following hydraulic system in detail:
- Hydraulic Crane.
  - Hydraulic Ram. 20

**End Semester Examination, May 2017**  
**B. Tech.–Third/Fourth Semester**  
**STRENGTH OF MATERIAL (M-403A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Define the following (*any ten*):

- a) Different types of strains.
- b) Young's modulus.
- c) Longitudinal strain.
- d) Modulus of rigidity.
- e) Neutral axis.
- f) Strain energy.
- h) Circumference stress.
- i) Thick compound cylinder.
- j) Crippling load.
- k) Equivalent length of a column.
- l) Sturts.

2 × 10

**PART-A**

- Q.2 a) A steel bar 300 mm long, 50mm wide and 40mm thick is subjected to a pull of 300 kN in the direction of its length. Determine the change in volume. Take  $E = 2 \times 10^5 \text{ N/mm}^2$  and  $m = 4$ . 12
- b) Draw and define Mohr's circle for a body subjected to direct stress in two mutually perpendicular directions when the stresses are unequal and alike. 8
- Q.3 a) Find section modulus of i) rectangular section ii) circular section of beam section. 10
- b) A cantilever of length 2m fails when a load of 2 kN is applied at the free end. If the section of the beam is 40 mm × 60 mm, find the stress at the failure. 10
- Q.4 a) Find maximum torque transmitted by a hollow circular shafts. 12
- b) A solid cylindrical shaft is to transmit 300 kW power at 100 rpm, find the diameter, if the shear stress is not to exceed 80 N/mm<sup>2</sup>. 8

**PART-B**

- Q.5 A steel rod is 2m long and 50 mm in diameter. An axial pull of 100 kN is suddenly applied to the rod. Calculate the instantaneous stress induced and also the instantaneous elongation produced in the rod. Take  $E = 200 \text{ GN/m}^2$ . 20
- Q.6 a) Prove that the i) circumferential stress ii) longitudinal stress are given by:
- $$1) \sigma_c = \frac{p x d}{2t} \qquad 2) \sigma_c = \frac{p x d}{4t} \qquad 12$$
- b) What do you mean by a thick compound cylinder? How to determine hoop stress in a thick compound cylinder? 8
- Q.7 A hollow cylindrical cast iron column is 4 m long with both ends fixed. Determine the minimum diameter of the column if it has to carry a safe load of 250 kN with a factor of

safety of 5. Take the internal diameter as 0.8 times the external diameter. Take  $\sigma_c = 500 \text{ N / mm}^2$  and  $a = \frac{1}{1600}$  in Rankins formula. 20



**End Semester Examination, May 2017**  
**B. Tech. — Fourth Semester**  
**MANUFACTURING TECHNOLOGY-II (M-404A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) What is tool signature?
  - b) Differentiate between turning and facing operation in lathe machine.
  - c) Name the major parts of a lathe machine.
  - d) Differentiate between drilling and boring.
  - e) Write the functions of cutting fluid.
  - f) Is it possible to machine square plate on lathe machine? If yes, then how?
  - g) Write the name of four cutting tool materials.
  - h) Explain the term feed for lathe machine.
  - i) Differentiate between shaper and planner.
  - j) What is up milling operation?
- 2 × 10

**PART-A**

- Q.2
- a) Explain Earnest merchant force diagram and analyze various force relations resulting from it. 12
  - b) Describe various types of chips formed during machining process with the help of neat sketches. 8
- Q.3
- a) The useful tool life a HSS tool machining mild steel at 18 m/minute is 180 minutes. Calculate the tool life when tool operates at 24 m/minute.  $n = 0.125$ . 10
  - b) Describe in detail various cutting tools materials used for machining process. 10
- Q.4
- a) Derive an expression for optimum cutting speed in turning for minimum cost. 16
  - b) Explain the term machinability and machinability index. 4

**PART-B**

- Q.5
- a) Explain the working of lathe machine with the help of neat sketch. 12
  - b) Describe various work holding devices of a lathe machine with the help of neat sketches. 8
- Q.6
- a) Describe various milling operations performed on milling machine with the help of neat sketches. 12
  - b) Describe the constructional detail of a radial drilling machine with the help of neat sketch. 8
- Q.7
- a) Calculate the machining time to drill a hole 50 mm deep in brass with cutting speed = 75 m/minute and  $feed = 0.175$  mm/rev. 15
  - b) Derive an expression to determine machining time on lathe machine. 8

**End Semester Examination, May 2017**  
**B. Tech.–Fourth Semester**  
**KINEMATICS OF MACHINES (M-405A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

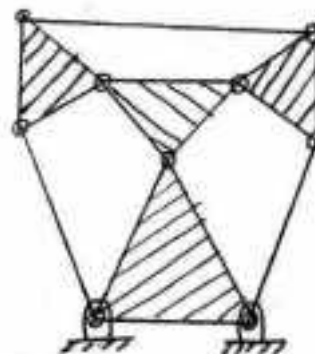
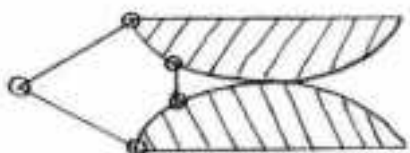
Q.1 Briefly describe:

- a) Closed and unclosed pair.
- b) Mechanism.
- c) Module angle of a gear.
- d) Pressure angle of a gear.
- e) Epicyclic gear train.
- f) Speed ratio of a gear train.
- g) Pitch curve of a cam and follower system.
- h) Tangent cam.
- i) Precision points in synthesis of mechanism.
- j) Kennedy's theorem.

2 × 10

**PART-A**

- Q.2 a) Explain types of constrained motion with the help of examples and sketches. 10  
 b) Find degrees of freedom of the mechanisms shown in figures.



10

- Q.3 a) Derive an expression for length of path of contact of a gear and pinion in mesh. 8  
 b) Two  $20^\circ$  gears have a module pitch of 4 mm. The number of teeth on gears 1 and 2 are 40 and 24 respectively. If the gear 2 rotates at 600 rpm, determine the velocity of sliding when the contact is at the tip of the tooth of gear 2. Take addendum equal to one module. Also find the maximum velocity of sliding. 12
- Q.4 a) Differentiate between simple gear train, compound gear train and epicyclic gear train. 6  
 b) An epicyclic gear train consists of a pinion, a wheel of 40 teeth and an annulus with 84 internal teeth concentric with the wheel. The pinion gears with the wheel and the annulus. The arm that carries the axis of the pinion rotates at 100 rpm. If the annulus is fixed, find the speed of the wheel. If wheel is fixed, find the speed of the annulus. 14

**PART-B**

- Q.5 a) Briefly describe the types of followers in a cam and follower arrangement. 6  
 b) Draw the profile of a cam operating a knife edge follower having a lift of 40 mm. The cam has a minimum radius of 30 mm and axis of the follower passes through the axis of cam rotation.

The followers move with SHM. It rises during cam rotation of  $100^\circ$ , dwells at the top for  $60^\circ$  and returns during next  $90^\circ$  of cam rotation.

Draw the cam profile.

14

Q.6 Design a four link mechanism to coordinate three positions of the input and the output links as follows:

$$\theta_1 = 20^\circ, \phi_1 = 35^\circ$$

$$\theta_2 = 35^\circ, \phi_2 = 45^\circ$$

$$\theta_3 = 50^\circ, \phi_3 = 60^\circ$$

20

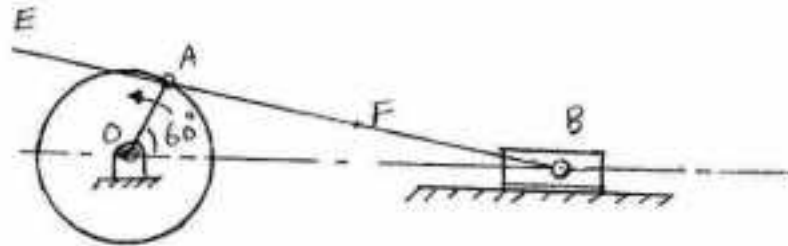
Q.7 a) In a slider – crank mechanism, the crank is 480 mm long and rotates at 20 rad/s in the counter clockwise direction. The length of the connecting rod is 1.6 m. When the crank turns  $60^\circ$  from the inner dead centre, determine the (see figure)?

i) Velocity of the slider.

ii) Velocity of a point E located at a distance 450 mm on the connecting rod extended.

iii) Position and velocity of a point F on the connecting rod having the least absolute velocity.

iv) Angular velocity of connecting rod.



14

b) State and prove Kennedy's theorem.

6

**End Semester Examination, May 2017**  
**B. Tech.–Fifth Semester**  
**INDUSTRIAL ENGINEERING(M-501A)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1 a) Differentiate between 'production' and 'productivity'.  
 b) Distinguish between 'direct' and 'indirect costs'.  
 c) Explain in brief the importance of work study.  
 d) What do you understand by 'inventory'? Give its classification.  
 e) What do you understand by 'inspection'? State various types of inspection. 5x4

**PART-A**

- Q.2 a) What do you understand by 'method study'? Explain the process of method study. 10  
 b) Explain the term work measurement and the process to arrive at 'standard time'. 10
- Q.3 a) What are different types of costs and how do you arrive at selling price of any product? 10  
 b) What do you understand by 'Break Even Point'? How do you calculate BEQ? 10
- Q.4 a) Explain economic batch quantity (EBQ) with and without shortage. 8  
 b) A company requires a part at the rate of 600kg per year. The cost of item is Rs 40/- per kg. Inventory carrying cost is 10% and procurement cost is Rs 200/- per order. Calculate:  
 i) Economic order quantity.  
 ii) Optimum number of orders. 12

**PART-B**

- Q.5 a) What are various functions of production planning and control department? Also explain different types of production systems. 10  
 b) Give the overall process of PPC so as to derive at master production schedule. 10
- Q.6 a) What are control charts and how they are used to control the quality? 8  
 b) Compute the values of  $3\sigma$  limits for  $\bar{X}$  and R charts for the parts being manufactured in the factory. The subgroup size is 4. After 20 subgroups  $\sum \bar{X} = 412.83$  and  $\sum R = 3.39$ . Also estimate the value of  $\sigma$  on the assumption that process is in statistical control.  
[d<sub>2</sub> = 2.059; D<sub>4</sub> = 2.28, D<sub>3</sub> = 0 (for subgroup of 4)] 12
- Q.7 Write short notes on (*any four*):  
 a) TQM.  
 b) ISO 9000 quality system.  
 c) Kaizen.  
 d) Deming awards.  
 e) Just in time (JIT). 4x5

**End Semester Examination, May 2017**  
**B. Tech.–Fifth Semester**  
**DYNAMICS OF MACHINES(M-502A)**

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Briefly explain the following:

- a) Kinematic chain.
- b) Transfer of a force from one plane to another.
- c) Coupled locomotive.
- d) Stability of governor.
- e) Sensitiveness of a governor.
- f) Active and reactive gyroscopic couples.
- g) Gyroscopic effect on a pitching ship.
- h) Equilibrium conditions for a three force member.
- i) Principle of superposition.
- j) Crack effort in an engine.

2x10

**PART-A**

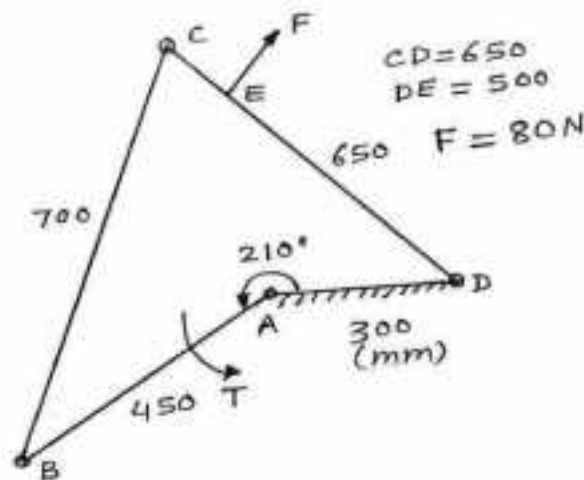
- Q.2 a) Differentiate between static balancing and dynamic balancing. 5  
 b) Four masses A, B, C and D carried by a rotating shaft at radii 80mm, 100mm, 160mm and 120mm respectively are completely balanced. Masses B, C and D are 8kg, 4kg and 3kg respectively. Determine the mass A and the relative angular position of four masses if the planes are spaced 500mm apart. 15
- Q.3 a) Find out an expression for the resultant unbalanced force on a reciprocating mass  $m$  in terms of crank angle  $\theta$  when a fraction 'C' of the reciprocating mass is balanced. 6  
 b) In an outside cylinder uncoupled locomotive mass of rotating parts per cylinder = 360kg, mass of reciprocating part per cylinder = 300kg, Angle between cranks =  $90^\circ$ , crank radius = 0.3m, cylinder centres = 1.75 m, radius of balancing masses = 0.75m, wheel centres = 1.45m.  
 If whole of the rotating and two-thirds of the reciprocating parts are to be balanced in planes of the driving wheels, find the magnitude and angular positions of the balancing masses. 14
- Q.4 a) Explain the terms spinning, precession and gyroscopic effect. Derive an expression for gyroscopic couple in terms of usual parameters. 6  
 b) Following data is given for a two wheeler negotiating a turn. Combined mass of vehicle and rider = 260kg, moment of inertia of the engine fly-wheel =  $0.4\text{kg-m}^2$ , moment of inertia of each wheel =  $1.2\text{kg-m}^2$ . Speed of engine is 5 times the speed of wheel in the same direction.  
 Height of centre of gravity of rider with vehicle is 0.5m. Two wheeler speed = 90km/h, wheel radius 300mm, radius of turn 60m. Find the angle of inclination of the vehicle from vertical. 14

**PART-B**

- Q.5 a) Describe classifications of governors. 6

- b) In a porter governor, each of the four arms is 400mm long. The upper arms are pivoted on the axis of rotation whereas the lower arms are attached to the sleeve at a distance of 45mm from the axis of rotation. Each ball has a mass of 8kg and load on the sleeve is 60kg. What will be the equilibrium speeds for the two extreme radii of rotation of 250 mm and 300 mm of governor balls? 14

- Q.6 a) Explain the principle of virtual work with an example. 5  
b) Find the torque required to be applied to link AB of the linkage shown in the figure to maintain by the static equilibrium.



15

- Q.7 a) Explain D'Alembert's principle. 5  
b) The turning moment diagram for a petrol engine is drawn to a vertical scale of  $1\text{ mm} = 500\text{ N-m}$  and a horizontal scale of  $1\text{ mm} = 3^\circ$ . The turning moment diagram repeats itself after every half revolution of the crank shaft. The areas above and below the mean torque line are 260, -580, 80, -380, 870 and -250  $\text{mm}^2$ , the rotating parts have a mass of 55kg and radius of gyration of 2.1m. If the engine speed is 1600 rpm, determine the coefficient of fluctuation of speed. 15

# End Semester Examination, May 2017

## B. Tech.–Fifth Semester MACHINE DESIGN(M-503)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q. 1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1 a) What are factors that affect endurance limit of machine part?  
 b) How will you design shaft on the basis of torsional rigidity?  
 c) Explain surging phenomenon in springs.  
 d) What is difference between thick film lubrication and thin film lubrication?  
 e) What is Lewis form factor? How does it vary with number of teeth on gear? 4x5

### PART-A

- Q.2 a) Describe Miner's equation and its use. 5  
 b) A forged steel bar, 50 mm in diameter, is subjected to a reversed bending stress of 250 N/mm<sup>2</sup>. The bar is made of steel 40C8 ( $S_{ut}=600\text{N/mm}^2$ ). Calculate the life of the bar for a reliability of 90%. Take endurance limit stress of steel as 0.5 times  $S_{ut}$ . 15

- Q.3 a) What are advantages of hollow shaft over a solid shaft? 6  
 b) A solid circular shaft of diameter 'd' is subjected to a bending moment of  $M_b$  and torsional moment  $M_t$ . Prove that according to maximum shear theory:

$$\frac{0.5 S_{yt}}{(fs)} = \frac{16}{\pi d^3} \sqrt{M_b^2 + M_t^2} \quad 14$$

- Q.4 A helical compression spring is subjected to  $P_{min}=40\text{N}$  and  $P_{max}=120\text{N}$  load cycle. The diameter of wire is 3mm with a spring index of  $c=7$ . The spring is made of oil hardened and tempered steel. Determine the factor of safety if,  $\sigma_{ut}=1500\text{N/mm}^2$ . 20

### PART-B

- Q.5 a) Explain the difference between hydrodynamic and hydrostatic lubrications bearings giving the advantages of both. 8  
 b) A single row deep-groove ball bearing is subjected to a pure radial force of 3 kN from a shaft that rotates at 600 rpm. The expected life  $L_{10h}$  of the bearing is 30,000 hr. The minimum acceptable diameter of the shaft is 40 mm. Select a suitable ball bearing for this application. 12

- Q.6 Design a pair of spur gears with 20° full-depth involutes teeth. The pinion shaft is connected to a 12 kW, 1400 rpm motor. The starting torque of motor is 150% of rated torque. The speed reduction is 4:1. Pinion as well as gear are made of plain carbon steel 40 C8 ( $S_{ut}=600\text{N/mm}^2$ ). The factor of safety is 1.5. 20

- Q.7 a) Define ergonomics. Explain ergonomics and value engineering considerations in design. 10  
 b) What is standardization? Explain various design consideration in machining. 10

**End Semester Examination, May 2017**  
**B. Tech.–Fifth Semester**  
**PRODUCTION ENGINEERING(M-504B)**

Time: 3 hrs

Max Marks:100

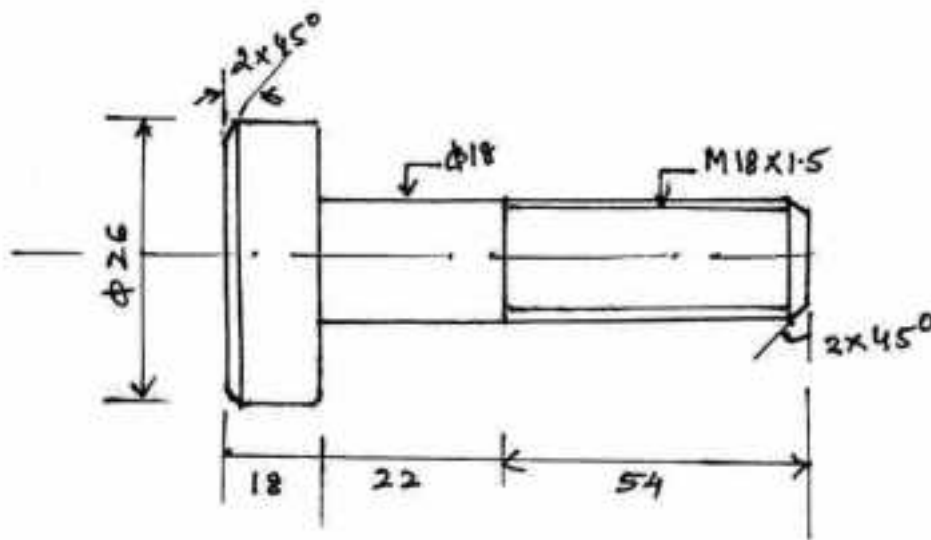
No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- Explain sequence of operations in process planning.
  - Explain "part print analysis".
  - What is the purpose of a jig brush?
  - Enlist the various methods for manufacturing of gear.
  - State the function of "3 – set of taps" in internal threads machining.
  - Explain the term "loading and glazing" used in grinding terminology.
  - State the advantage of thread rolling.
  - Differentiate between punching and blanking.
  - What is meant by "wheel structure" an applied to grinding process?
  - Show with an example how a surface finish representation is done?
- 2x10

**PART-A**

- Q.2 A batch of 1000 components of aluminum is to be produced form a blank of  $\Phi 27$ .  
 Generate a process sheet for the component as shown in the figure.



20

- Q.3
- Explain with neat diagrams of various clamping devices used in jigs and fixtures. 10
  - Explain 3-2-1 location principles. 5
  - State the materials & purpose of a jig brush. 5
- Q.4
- Draw a neat and labeled diagram of a progressive die. 8
  - A hole of 60mm diameter is to be produced in a steel plate of 3.00mm thickness. The ultimate shear strength of the plate material is 450N/mm<sup>2</sup>. Take percentage penetration as 40% of thickness of sheet. Estimate  
 i) Punching force ii) Punch diameter iii) Work done 12

**PART-B**

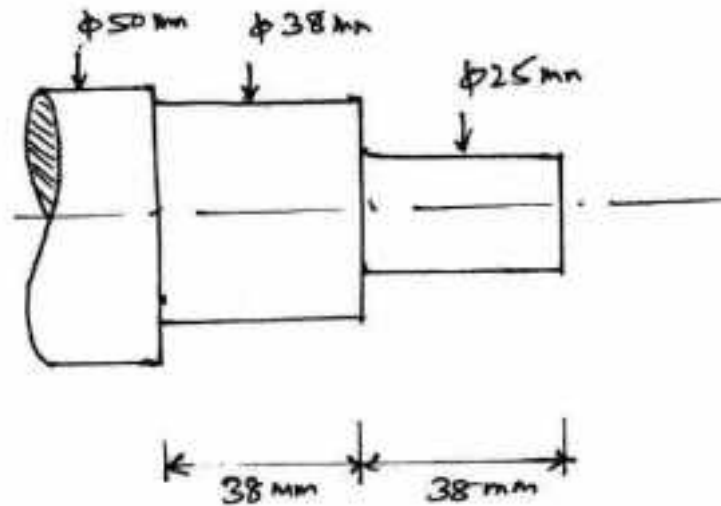
- Q.5
- Draw a neat and labeled diagram of a centreless grinding machine. State the principle and working of the process done. 12



- b) Explain how "balancing" of grinding wheels is done. 4  
 c) Explain how "mounting" of grinding wheels is done 4

- Q.6 a) Explain gear cutting by milling and hobbling with neat sketches. 10  
 b) With the help of neat diagrams explain the various methods of thread manufacturing using dies and tools on a shop floor. 10

- Q.7 a) Estimate the time to drill a  $\Phi 12.7\text{mm}$  hole in a brass plate of 50mm thickness. The cutting speed is 75m/min and feed is 0.175mm/rev. 10  
 b) What is the machining time to turn the dimensions given in the figure? The material is brass with a cutting speed of 100m/min and feed of 0.75 mm/revolution.



10

**End Semester Examination, May 2017**  
**B. Tech.–Fifth Semester**  
**METROLOGY, MEASUREMENT & CONTROL(M-505)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) Define 'linear metrology'.
  - b) Name the instruments used for angular measurement.
  - c) Define 'pressure'.
  - d) Write the function of tachometers.
  - e) What is transducer?
  - f) How will you measure force?
  - g) What are static characteristics of instruments?
  - h) Write the dynamic characteristics of instrument.
  - i) What do you understand by the term 'Control System'?
  - j) What is bridge circuit?

2x10

**PART-A**

- Q.2
- a) What are instruments used for angular measurements? Explain any one method with neat sketch. 10
  - b) What do you mean by internal and external threads? Describe a suitable method of inspection for the profile of screw thread with sketches. 10
- Q.3
- a) Discuss the types of flow meters and explain any one in detail. 10
  - b) Explain the working of a load cell with a neat sketch. 10
- Q.4
- a) Discuss the types of displacement measurement. 10
  - b) Explain the working of electro-mechanical transducer. 10

**PART-B**

- Q.5
- a) What are the elements of a control system? Explain servo-mechanism? 10
  - b) Describe the overall transfer function of a multi – loop control system with suitable example. 10
- Q.6
- a) What do you mean by zero, first and second order response system? Derive expression for anyone. 12
  - b) What are various kinds of errors which may originate in an instrument and give reason and precautions to be taken? 8
- Q.7 Write short notes on (*any four*):
- a) Shielding and grounding.
  - b) ADC converter.
  - c) Data acquisition.
  - d) Interfacing.
  - e) Signal and system analyzers.

4x5

# End Semester Examination, May 2017

## B. Tech.–Fifth Semester MACHINE DESIGN - I (M-508)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

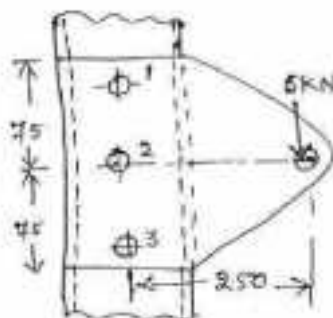
Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1
- Define the factor of safety in design.
  - What is role of selection of material in design?
  - Write advantages of threaded joint.
  - What do you mean by power screw?
  - State the advantages of welded joint over riveted joint.
  - Differentiate between 'lap' and 'belt joint'.
  - What are advantages of V – belts over flat belts?
  - Write applications of chain drive.
  - Why are clutches usually design on the basis of uniform wear?
  - What is self-energizing condition of a brake?

2x10

### PART-A

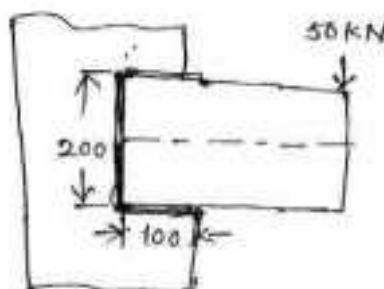
- Q.2
- What is brain storming? Describe the procedure, advantages and limitations of brain storming in detail. 10
  - Discuss the different types of feasibility study in engineering design. 10
- Q.3
- What is the power screw? What type of threads are used in power screw and why? 6
  - A steel plate subjected to a force of 5 kN and fixed to a channel by means of three identical bolts is shown in figure. The bolts are made of plain carbon steel of 30C<sub>8</sub> ( $S_{YF} = 400\text{N/mm}^2$ ) and the factor of safety is three. Determine the diameter of the shank.



All dimensions are in mm

14

- Q.4
- A welded connection of steel plate is shown in figure. It is subjected to an eccentric force of 50 kN. Determine the size of the weld, if the permissible shear stress in the weld is not to exceed  $70\text{N/mm}^2$ .



All dimensions are in mm

14

- b) Discuss the caulking and fullering process. Also write their objectives in detail. 6

**PART-B**

- Q.5 a) It is required to select a V – belt drive the connect a 20KW, 1440 rpm motor to a compressor running at 480 rpm for 15hrs/day. Space is available for a centre distance of approximately 1.2 m. Determine:
- (i) The specification of belt
  - (ii) Diameters of motor and compressor pulleys.
  - (iii) Correct centre distance. 15
- b) Write the function of coupling. Differentiate between coupling and clutch. 5
- Q.6 a) Discuss the two theories used in design of friction plates. 8
- b) A single plate clutch consists of one pair of contacting surfaces. The inner and outer diameters of the friction disc are 125 mm and 250mm respectively. The co – efficient of friction is 0.25 and the total axial force is 15kN. Calculate the power transmitting capacity of the clutch at 500 rpm using:
- i) Uniform wears theory.
  - ii) Uniform pressure theory. 12
- Q.7 a) A double block brake consist of two symmetrical pivoted shoes.The diameter of the brake drum is 300rpm and the angle of wrap ( $2\theta$ ) for each shoe is  $90^\circ$ . The pivot of shoe is located in such a way as to avoid the couple due to frictional force. Determine the distance of pivot from the axis of brake drum. 15
- b) What are the applications, advantages and limitations of disc brake? 5

**End Semester Examination, May 2017**  
**B. Tech.–Sixth Semester**  
**OPERATIONS RESEARCH(M-601A)**

Time: 3 hrs.

Max Marks:100

No. of pages:2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- Name different methods for decision making under uncertainty.
  - Write the various phases in solving OR problem.
  - What do you understand by infeasibility in LPP?
  - How do you identify the presence of degeneracy in Simplex Method?
  - Write the steps involved in Vogel's Approximation Method.
  - How assignment model is a special case of transportation model?
  - Explain various queue disciplines.
  - Write the process of network construction.
  - What is need of simulation?
  - Name four applications, where simulation technique is used?
- 2 × 10

**PART-A**

- Q.2
- What is decision making? Explain and differentiate this under the conditions of certainty and uncertainty. 8
  - The following matrix gives the payoff of different strategies  $S_1, S_2$  and  $S_3$ , against different conditions  $N_1, N_2, N_3$  and  $N_4$ . Indicate decision making under:
    - Pessimistic
    - Optimistic
    - Regret
    - Equal probability

	$N_1$	$N_2$	$N_3$	$N_4$
$S_1$	4,000	– 100	6,000	18,000
$S_2$	20,000	5,000	400	0
$S_3$	20,000	15,000	– 2,000	1,000

12

- Q.3
- Explain the graphical method of solving LPP. What are its limitations? 6
  - Solve the following LPP using simplex method:
 
$$Z_{\max} = 3x_1 + 2x_2$$
 Subject to,
 
$$x_1 + x_2 \leq 4$$

$$x_1 - x_2 \leq 2$$

$$x_1, x_2 \geq 0$$
14

- Q.4
- Solve the following transportation problem and check its optimality.

		To				
		1	2	3	4	Supply
From	A	7	3	8	6	60
	B	4	2	5	10	100
	C	2	6	5	1	40
Demand →		20	50	50	80	

10

- b) Solve the following assignment problem. The matrix carrier processing time in hours.

		Operator				
		A	B	C	D	E
Job	1	20	22	35	22	18
	2	4	26	24	24	7
	3	23	14	17	19	19
	4	17	15	16	18	15
	5	16	19	21	19	25

10

### **PART-B**

- Q.5 a) State some of the important distributions of arrival interval and service times used in queuing models. 8
- b) A self-service store employs one cashier at its counter. Nine customers arrive on an average every five minutes while cashier can serve ten customers in five minute. Assuming Poisson distribution for arrival rate and exponential distribution for service time, find:
- i)  $L_s$  ii)  $L_q$   
 iii)  $W_s$  iv)  $W_q$  12
- Q.6 a) Discuss similarities and differences of CPM and PERT. 6
- b) Draw a network to represent the network and find the minimum time of completion of the project when time, in days, of each task is as follows:

Task:	A	B	C	D	E	F	G	H	I
Time:	8	10	8	10	16	17	18	14	9

Also identify the critical path.

14

- Q.7 a) Describe simulation process. What are reasons for using simulation? 6
- b) A bakery keeps stock of a popular brand of cake. Daily demand based on past experience is given below:

Daily demand:	0	15	25	35	45	50
Probability:	0.01	0.15	0.20	0.50	0.12	0.02

Consider the sequence of following random numbers:

48, 78, 09, 51, 56, 77, 15, 14, 68, 09

- i) Simulate the demand for next 10 days.
- ii) Find the stock situation, if the owner of bakery decides to make 35 cakes every day. Also estimate the daily average demand for the cakes on the basis of simulated data. 14

# End Semester Examination, May 2017

## B. Tech.–Fifth Semester CAD/CAM(M-602)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Briefly answer:

- What is orthogonal projection?
- Define scaling matrix and reflection matrix about x-axis.
- What is  $C^1$  continuity in curves?
- Define 'analytical curves'.
- What is characteristic polygon?
- What is automation?
- Write parametric equation of ellipse and hyperbola.
- Define 'ruled surface'.
- What is control point?
- Explain G92 code.

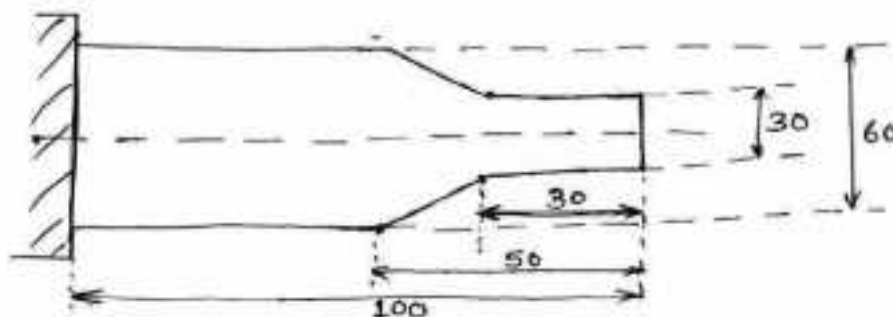
2x10

### PART-A

- Q.2 a) Explain B – spline curve along with parametric equation. Write the advantages of B-spline curve over Bezier Curves. 10  
b) Define 'CAD, CAM and CIM'. Give brief descriptions of their applications in industries. 10
- Q.3 a) A triangle having vertices A (1,1), B (2,9) and C (6,7) is scaled by 4 units in x – direction and then rotated by  $30^\circ$  in clockwise direction, keeping point A fixed. Find final transformation matrix. 10  
b) A line having end points (35, 5, 60) and (6,12,80) is rotated about x – axis, keeping point (35,5,60) fixed, by an angle of  $30^\circ$  anticlockwise. Find new coordinates of file. 10
- Q.4 a) Generate a Bezier Curve using following control points: (2,0), (4,3),(5,2),(4,-2),(5,-3), and (6,-2). 10  
b) What do you understand by interpolation and approximation? Explain blending function for cubic spline. How cubic spline is different from B – spline? 10

### PART-B

- Q.5 a) Explain CAPP and various benefits derived from it. 10  
b) What is group technology? Explain part classification and write various coding systems. Why group technology is developed? Write its advantages. 10
- Q.6 a) Write an NC part program for figure shown below:(All dimensions are in mm)



10

- b) i) Describe fixed, programmable and flexible automation used in industries with example. 5
  - ii) Describe various NC coordinate systems used for NC systems. 5
- Q.7 a) Explain the concept of direct numerical control systems (DNC) in detail. 10
- b) Define 'computer numerical control (CNC)'. Explain functions of CNC in detail. 10



**End Semester Examination, May 2017**  
**B. Tech.–Fourth / Sixth Semester**  
**HEAT TRANSFER(M-604)**

Time: 3 hrs.

Max Marks:100

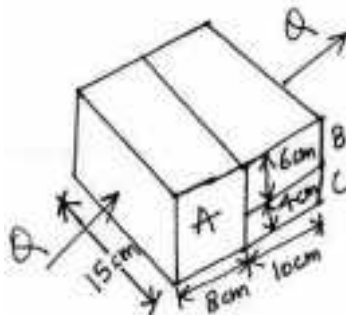
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Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- What is critical thickness of insulation?
  - State the modes of heat transfer.
  - Define Biot and Fourier numbers.
  - Differentiate between natural and forced convection.
  - What is logarithmic mean temperature difference?
  - Define 'fouling factor'.
  - What do you understand by unsteady state heat transfer?
  - Which portion of electromagnetic spectrum is covered by thermal radiation?
  - What do you understand by lumped system?
  - What do you understand by Stefan-Boltzmann law of thermal radiation? 2 × 10

**PART-A**

- Q.2
- Derive an expression for heat transfer rate under one dimensional steady state conduction through a hollow sphere. 10
  - A small electric heater uses a wire of 3mm diameter with 0.9 mm thick insulation ( $K = 0.12 \text{ W/m}^\circ\text{C}$ ). The heat transfer coefficient ( $h_0$ ) on the insulated surface is  $32 \text{ W/m}^2\text{C}$ . Determine the critical thickness of insulation and also calculate the percentage change if critical thickness is used. Assume that the temperature difference between wire surface and air is constant. 10
- Q.3
- Derive an expression for temperature distribution for an infinitely long fin with rectangular cross section. 10
  - What do you understand by thermal resistance?



Calculate the total thermal resistance of above slab arrangement, where  $K_A = 50 \text{ W/m}^\circ\text{C}$ ,  $K_B = 40 \text{ W/m}^\circ\text{C}$ ,  $K_C = 30 \text{ W/m}^\circ\text{C}$ . 10

- Q.4
- State the assumptions of lumped system analysis. Also, derive the expression:

$$\frac{T_i - T_\infty}{T - T_\infty} = e^{\left(\frac{hA}{\rho V C_p}\right)\tau}$$

10

- A spherical thermocouple junction of diameter 0.706mm is to be used for measurement of temperature of a gas stream. The convective heat transfer coefficient of the head surface is  $400 \text{ W/m}^2\text{k}$ ,  $\rho = 8950 \text{ kg/m}^3$ ,  $C_p = 0.383 \text{ kJ/kg k}$ .

If the thermocouple initially at  $30^{\circ}\text{C}$  is placed in a hot stream of  $300^{\circ}\text{C}$ , calculate the time taken by it to reach  $298^{\circ}\text{C}$ . 10

**PART-B**

- Q.5 a) Derive energy equation for thermal boundary layer over a flat plate. 10  
 b) Explain thermal boundary layer. How is thermal boundary layer different from hydrodynamic boundary layer? What is the significance of Prandtl No. with reference to boundary layer? 10
- Q.6 a) Differentiate between black body and gray body. Also, state and explain Stefan-Boltzmann law of radiation. 10  
 b) A vertical plate 60 cm high and 30 cm wide is maintained at a temperature of  $95^{\circ}\text{C}$  in a room where the air is  $20^{\circ}\text{C}$  and 1 atm. The walls of the room are also at  $20^{\circ}\text{C}$ . Assume that  $\epsilon = 0.8$  for the plate. How much radiant heat is lost by the plate? 10
- Q.7 a) Derive the expression for LMTD in case of parallel flow heat exchanger. 10  
 b) Water at the rate of 68 kg/min is heated from  $35$  to  $75^{\circ}\text{C}$  by an oil having a specific heat of  $1.9 \text{ kJ/kg}^{\circ}\text{C}$ . The fluids are used in a counter flow double pipe heat exchanger and the oil enters at  $110^{\circ}\text{C}$  and leaves at  $75^{\circ}\text{C}$ . The overall heat transfer coefficient,  $U = 320 \text{ W/m}^2\text{C}$ . Calculate the heat exchanger area. 10

**End Semester Examination, May 2017**  
**B. Tech.–Sixth Semester**  
**MACHINE DESIGN-II (M-607)**

Time: 3 hrs

Max Marks: 100

No. of pages: 2

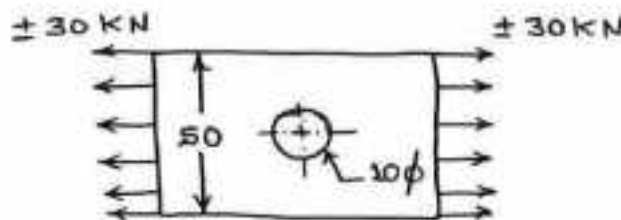
Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.

- Q.1
- What is fatigue failure?
  - What is endurance limit?
  - What types of stresses are induced in shafts?
  - What are the advantages of hollow shaft over solid shaft?
  - What are the applications of spring?
  - What is spring index?
  - What are the applications of sliding-contact bearing?
  - Name the various types of ball bearings.
  - Differentiate between beam and wear strength of gear.
  - What do you mean by the term: 'standardisation'?

2x10

**PART-A**

- Q.2
- A plate made of steel 20C8 ( $S_{ut} = 440 \text{ N/mm}^2$ ) in hot rolled and normalized condition is shown in the figure. It is subjected to a completely reversed axial load of 30 kN. The notch sensitivity factor  $q$  can be taken as 0.8 and the expected reliability is 90%. The size factor is 0.85. The factor of safety is 2. Determine the plate thickness for infinite life.



- Explain with neat sketches, Soderberg and Goodman lines.

14

6

- Q.3
- A rotating shaft 40 mm in diameter, is made of steel FeE 580 ( $S_{yt} = 580 \text{ N/mm}^2$ ). It is subjected to a steady torsional moment of 250 N-m and bending moment of 1250 N-m. Calculate the factor of safety based on:
    - Maximum principal stress theory.
    - Maximum shear stress theory.
  - A propeller shaft is required to transmit 50 kW power at 600 rpm. It is a hollow shaft, having an inside diameter 0.8 times of the outside diameter. It is made of steel ( $S_{yt} = 380 \text{ N/mm}^2$ ) and the factor of safety is 4. Calculate the inside and outside diameters of the shaft.  
 Assume  $S_{sy} = 0.5 S_{yt}$

10

10

- Q.4
- It is required to design a helical compression spring subjected to a force of 500 N. The deflection of the spring corresponding to this force is approximately 20 mm. The spring index should be 6. The spring is made of cold-drawn steel wire with ultimate tensile strength of  $1000 \text{ N/mm}^2$ . The permissible shear stress for the spring wire can

be taken as 50% of the ultimate tensile strength ( $G = 81370\text{N/mm}^2$ ). Design the spring and calculate:

- i) Wire diameter.
- ii) Mean coil diameter.
- iii) Number of active coils.
- iv) Total number of coils.
- v) Free length of the spring.
- vi) Pitch of the coils. 15
- b) Write a note on nipping in spring. 5

### **PART-B**

- Q.5 a) A ball bearing is operating on a work cycle consisting of three parts-a radial load of 300N at 1440rpm for one quarter cycle, a radial load of 500N at 720rpm for one half cycles, and radial load of 2500N at 1440rpm for the remaining cycle. The expected life of the bearing is 10000hrs. Calculate the dynamic load carrying capacity of the bearing. 8
- b) The following data is given for 360° hydrodynamic bearing:  
 Journal diameter = 100mm  
 Bearing length = 100mm  
 Radial load = 50KN  
 Journal speed = 1440rpm  
 Radial clearance = 0.12mm  
 Viscosity of lubricant = 16cp  
 Calculate:  
 i) Minimum film thickness.  
 ii) Coefficient of friction.  
 iii) Power lost in friction. 12
- Q.6 It is required to design a pair of spur gears with 20° full depth involutes teeth based on the Lewis equation. The velocity factor is to be used to account of dynamic load. The pinion shaft is connected to a 10KW, 1440rpm motor. The starting torque of the motor is 150% of the rated torque. The speed reduction is 4:1. The pinion as well as the gear is made of plain carbon steel 40C8 ( $S_{yt} = 600\text{ N/mm}^2$ ). The factor of safety can be taken as 1.5. Design the gears, specify their dimensions. 20
- Q.7 a) Explain ergonomic considerations in design. 10  
 b) Explain the design considerations of castings. 10

**End Semester Examination, May 2017**  
**B. Tech.–Fourth / Sixth Semester**  
**IC ENGINE AND GAS TURBINE(M-621)**

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1 a) Define the following:  
 i) Clearance Volume  
 ii) Compression Ratio  
 b) What do you mean by specific fuel consumption?  
 c) What are different air-fuel mixtures on which an engine can be operated?  
 d) Enlist the factors which affect the process of carburetion.  
 e) Define delay period in C.I. Engine.  
 f) What do you mean by Octane Rating of fuel?  
 g) Define flash and fire point.  
 h) Define brake thermal efficiency.  
 i) List the various methods available for finding Brake Power.  
 j) Write down two advantages of gas turbine over I.C. Engine. 2x10

**PART-A**

- Q.2 a) An air standard dual cycle has a compression ratio of 10. The pressure and temperature at the beginning of compression are one bar and 27°C. Determine:  
 i) The temperature at the end of constant volume heat addition.  
 ii) Cut off ratio.  
 iii) Work done per kg of air.  
 iv) The cycle efficiency.  
 Assume:- $C_p = 1.004 \text{ kJ/kg K}$  and  $C_v = 0.717 \text{ kJ/kg K}$  of air. 15  
 b) Compare the efficiency of Otto, Diesel and Dual Cycle for the 'same compression ratio and heat input' with P – V and T – S diagram. 5
- Q.3 a) What are the functional requirements of Ignition System? 6  
 b) How are Injection System classified? Describe them briefly. 14
- Q.4 a) Explain stages of combustion in S.I engine and what are the factors that affect Flame Front Propagation? 14  
 b) What is meant by abnormal combustion in I.C. Engine? 6

**PART-B**

- Q.5 a) Differentiate between splash and pressure lubricating system and describe the operation of splash lubricating system with the help of neat sketch. 15  
 b) What is the importance of lubrication in I.C. Engine? 5
- Q.6 A 4-cylinder, 4 stroke petrol engine 6cm bore and 9cm stroke was tested at constant speed. The fuel supply was fixed to 0.13 kg/min and plugs of four cylinders were successively short circuited without change of speed.  
 The power – measurement were as follows:  
 With all cylinders working = 16.25 KW (B.P)  
 With No. 1<sup>st</sup> – cylinder cut off = 11.55 KW (B.P)  
 With No. 2<sup>nd</sup> – cylinder cut off = 11.65 KW (B.P)

With No. 3<sup>rd</sup> – cylinder cut off = 11.70 KW (B.P)

With No. 4<sup>th</sup> – cylinder cut off = 11.50 KW (B.P)

(B.P. is Brake Power)

Find:

- i) Indicated power of engine.
- ii) Mechanical efficiency.
- iii) Indicated thermal efficiency if calorific value of fuel used is 42000 kJ/kg.
- iv) Find the relative efficiency on indicated power basic, assuming clearance volume is 65 cc.

20

**Q.7** In a constant pressure open cycle gas turbine air enters at 1 bar and 20°C and leaves the compressor at 5 bar. Using the following data:

Temperature of gases entering the turbine = 680°C

Pressure loss in the combustion chamber = 0.1bar

Compressor efficiency = 85%

Turbine efficiency = 80%

Combustion efficiency = 85%

$\gamma = 1.4$ ,  $C_p = 1.024$  kJ/kg K for air and gas.

Find:

- i) The quantity of air circulation if the plant develops 1065 KW.
- ii) Heat supplied per Kg of air circulation.
- iii) The thermal efficiency of the cycle.

20

**End Semester Examination, May 2017**  
**B. Tech. –Sixth Semester**  
**POWER PLANT ENGINEERING(M-622)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.

Q.1 Write short notes on:

- a) Different types of power plants.
- b) Define 'reserve factor'.
- c) Rankine cycle.
- d) Hydrological cycle.
- e) What is an electrostatic precipitator?
- f) What is a PFBC system?
- g) What is CANDU-type reactor?
- h) Discuss importance of draft tubes.
- i) Explain the concept of De-aeration.
- j) What is economics load sharing?

2x10

**PART-A**

- Q.2 a) State the essential elements and components of a hydroelectric power plant. 12  
 b) Discuss the influence of factors on which site selection for a power plant depends. 8

- Q.3 a) Explain in detail the ASH handling system in steam power plants. 10  
 b) What is circulation? What is the difference between natural and forced circulation? 10

- Q.4 a) Explain in detail the setup and working principle of modern thermal power plants. 14  
 b) Why are the economizer tubes often finned and grided on the gas side? 6

**PART-B**

- Q.5 a) What are various types of combined cycle plants? What are the inherent advantages of such a plant? 8  
 b) A 150 MW power house is operating on combined cycle. Suction of air take place at 1 bar and 300K. The maximum temperature is limited to 800° C. The pressure ratio is 8. The gas turbine exhaust is further heated to 800°C before entering into the boiler furnace. The steam production is at 50 bar and 600°C. The exhaust temperature is 200°C. The condenser pressure is 0.05 bar. Consider isotropic efficiencies of rotating machine to be 100%. Find out thermal efficiency of power plant.  
 Take  $C_p = 1 \text{ kJ/kgK}$ , Ratio of specific heat = 1.4, Calorific value of fuel =  $4.2 \times 10^4 \text{ kJ/kg}$ . 12

- Q.6 Explain in detail basic nuclear reactor with a neat sketch, principles of nuclear energy and working of a nuclear power plant. 20

- Q.7 Explain in brief:  
 a) Incremental rate theory.  
 b) Cost of electrical energy.  
 c) Power plant operating characteristics.

d) Heat rate.

5x4



**End Semester Examination, May 2017**  
**B. Tech.–Sixth Semester**  
**AUTOMOBILE ENGINEERING (M-624)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q. 1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) Write any four types of car body styles.
  - b) Differentiate between front wheel and rear wheel drive vehicles.
  - c) Write down the basic requirements of clutch in a vehicle.
  - d) Write down the function of lighting in an automobile vehicle.
  - e) Name the desirable properties for tyres of the automobile vehicles.
  - f) What is the need of suspension system in an automobile vehicle?
  - g) Write the principle of friction clutch.
  - h) Explain the working of hydraulic clutch.
  - i) What is emission control system?
  - j) Name the different types of brakes.
- 2x10

**PART-A**

- Q.2
- a) What do you mean by 'Automobile'? Explain its classification in detail. 10
  - b) Explain the various requirements of automobile body. 5
  - c) Write any four safety considerations in an automobile vehicle. 5
- Q.3
- a) Explain the multiple clutch in detail with neat sketch. 10
  - b) Write a short note on over running clutch. 10
- Q.4
- a) Explain the working of synchromesh gear box with the help of neat sketch. 10
  - b) Write short notes on following:
    - i) Hotchkiss drive.
    - ii) Torque tube drive.
- 5x2

**PART-B**

- Q.5
- Write short notes on following with neat sketch:
- a) Toe-In / Toe-out.
  - b) Racer and pinion steering gear mechanism.
  - c) Types of suspension springs.
  - d) King pin inclination.
- 5x4
- Q.6
- a) Differentiate between 'disc' and 'drum brakes'. Also, draw the neat sketch to explain their working principles. 15
  - b) Write down the various factors affecting the brake performance in an automobile. 5
- Q.7
- Write short notes on:
- a) Exhaust gas recirculation system.
  - b) Sources for atmospheric pollution from the automobile vehicles.
  - c) Vehicle lightning system.
  - d) Lead acid battery (construction and working).
- 5x4

# End Semester Examination, May 2017

## B. Tech.–Sixth Semester ENERGY MANAGEMENT (M-625)

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1
- Define the 'renewable' and 'non-renewable' energy.
  - What is the need at energy audit?
  - Define the term: detailed energy audit.
  - What do you understand by the term: 'specific energy consumption'?
  - Name two reasons why steam is used as a heat transfer medium?
  - Define two losses occur in motors.
  - Name three types of commonly used lamps.
  - What do you understand by 'Air compressor'?
  - Define crater to be boiler evaporation rate.
  - What do you understand by the static head and friction head? 2 × 10

### PART-A

- Q.2
- Discuss the various types of heat losses in a boiler. What is the atomization of fuel oil in combustion? 10
  - What are information to be collected during the detailed energy audit? 10
- Q.3
- What are the benefits for industry implementing energy management/conservation programmes? 10
  - What are the functions of steam traps? Describe three types of steam traps used in the steam distribution system in industry. 10
- Q.4
- Elaborate the advantages of following energy sources of generation coal, gas/oil, solar and wind. Define the natural sources. 10
  - What are the classifications of energy conservation measures in industry? Classify the boilers. 10

### PART-B

- Q.5
- Define the ways for power factor improvement and its benefit. What are the tariff structure components? 10
  - Explain all the categories of energy saving opportunities in compressed air system. What is 'Receiver'? 10
- Q.6
- Describe the energy saving opportunities in the refrigeration and air-conditioning plant in detail. 12
  - Discuss the factors that affect the energy savings in motors. 8
- Q.7
- What do you understand by the term 'energy efficient use of steam' in industry? 8
  - Define the steam quality. What is the pressure reduction value? Define the cogeneration and bottoming cycle. Also draw a line diagram. 12

**End Semester Examination, May 2017**  
**B. Tech.–Seventh Semester**  
**SOLAR ENERGY AND ITS APPLICATIONS(M-626)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) What do you understand by 'scattered radiation'?
  - b) Why solar radiations are treated as mono directional radiations?
  - c) Define 'zenith angle'.
  - d) Define 'transfer efficiency coefficient'.
  - e) Explain air – mass ratio.
  - f) Differentiate between 'focusing and non – concentrating types of solar collectors'.
  - g) What properties should the materials used for manufacturing flat plate collectors possess?
  - h) Why is the storage of solar energy essential?
  - i) Define 'energy efficiency'.
  - j) Name a few applications of solar energy. 2x10

**PART-A**

- Q.2
- a) Calculate declination angle ( $\delta$ ) for December 15. 10
  - b) Calculate zenith angle, solar azimuth angle for a place with latitude of  $43^\circ$  at 9:00 AM solar time on February 11. 10
- Q.3
- a) Explain different types of solar collectors classified on the basis of orientation with the sun. 14
  - b) Differentiate between 'peak flux' and 'average flux'. 6
- Q.4
- a) Name and explain various terms in L/D equation. Give significance of each term. 8
  - b) Explain difference between flat plate solar collectors using water as heat transfer medium and air as heat transfer medium. 12

**PART-B**

- Q.5
- a) Explain different types of collector configurations with the help of diagrams. 10
  - b) Describe in detail the non-convective salt gradient solar pond with the help of a neat sketch. 10
- Q.6
- a) Discuss the process of sensible heat storage in water in detail. 10
  - b) Discuss latent heat storage. Mention materials used. 10
- Q.7
- a) Describe community heating and cooling system using solar cookers in detail. 10
  - b) Explain solar gas absorption refrigeration scheme in detail. 10

# End Semester Examination, May 2017

## B. Tech.–SixthSemester MECHATRONICS(M-634)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

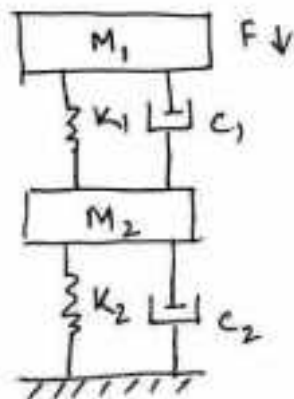
- Q.1
- State the major features of a mechatronics system with the help of a typical example.
  - What is a transducer? State one with an example.
  - What is steady state error of control system?
  - Classify the types of sensors.
  - What is closed and open loop control system?
  - Classify the addressing modes of 8085.
  - What is meant by conversion time?
  - What is quantization levels and its error during analog to digital conversion?
  - What are operational amplifiers?
  - Define 'passive and active electronics element'.
- 2x10

### PART-A

- Q.2
- What is the use of a logic gate? A locker has been rented in the bank. Express the process of opening the locker in terms of digital operations. 5
  - Explain the working of JK flip flop in detail. 10
  - Convert 11101001 from binary to base 10.
    - Convert 100100111 from binary to octal.5
- Q.3
- Explain the following with their applications in industries. 10
    - Strain gauge elements
    - Bimetallic strips.
  - What are pneumatic systems and explain its applications? 5
  - Diaphragm actuator to be used to open a control valve if a force of 500N must be applied to the valve. What diaphragm area is required for a control gauge pressure of 100kPa? 5
- Q.4
- Explain the microprocessor system briefly. 5
  - Explain types of buses used for digital signals. 5
  - Discuss architecture of 8085 microprocessor. 10

### PART-B

- Q.5
- Explain the building block equation of a rotational system. 10
  - Explain the governing equations of the following mechanical systems used in vehicle suspensions shown in the figure.



10

- |     |   |     |
|-----|---|-----|
| Q.6 | a) Explain DA convertor.                      | 4   |
|     | b) What is meant by filtering of frequencies? | 4   |
|     | c) Explain the following terms:               |     |
|     | i) Digital signal processing.                 |     |
|     | ii) Data acquisition systems.                 |     |
|     | iii) Testing and calibration.                 | 4x3 |
| Q.7 | a) Explain the design process for a system.   | 8   |
|     | b) Write short notes on:                      |     |
|     | i) Wind screen wiper motion.                  |     |
|     | ii) Pick and place robot.                     |     |
|     | iii) Radiator water level indicator.          | 4x3 |

# End Semester Examination, May 2017

## B. Tech.–Sixth Semester TOOL ENGINEERING(M-635)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- What is the basic composition of HSS tool?
  - What are the limitations of ceramic inserts?
  - What is the main drawback of a braked tipped tool?
  - How does a chip breaker break up a chip?
  - What are the major actions taking place at the point of drill?
  - How does changing the helix angle of a drill affect performance?
  - 'Broaching is better than milling', Comment.
  - How is the pitch of the teeth of broach selected?
  - Draw a neat sketch of a circular form tool.
  - Distinguish between 'peripheral milling' and 'free milling'.
- 2x10

### PART-A

- Q.2
- State the relative properties of the cutting tool materials in a tabular form: Carbide, Ceramic, CBN and PCD. 10
  - Explain the different types of theories of tool failures in detail. 10
- Q.3 Design HSS single point cutting tool shank to machine a mild steel workplace in a lathe. Also analyze and calculate the forces acting on tool. Assume suitable data wherever necessary. 20
- Q.4 Discuss the design features of a twist drill: helix angle, drill diameter, web thickness, flute length, point angle, shank, land width, margin. 20

### PART-B

- Q.5 Derive the expression for depth of cut in an angular group turning tool (V – notch). Also determine the angle to be ground on the tool face. 20
- Q.6 Discuss the design features of milling cutter:
- Size of the cutter.
  - Tool angles.
  - Width of land.
  - No. of teeth.
- 5x4
- Q.7 A key way is to be broached in the bore of low alloy steel gear. Design a broach with the following data:
- Bore diameter = 36mm
  - Bore length = 40mm
  - Width of keyway = 5mm
  - Depth of keyway = 3.2mm
- 5x4

**End Semester Examination, May 2017**  
**B. Tech.—Fifth / Sixth / Seventh Semester**  
**REFRIGERATION AND AIR CONDITIONING (M-821)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1 a) What do you understand by air-conditioning?  
 b) Define 'enthalpy and dry bulb temperature'.  
 c) Draw Bell-coleman cycle in P-V and T-S diagrams.  
 d) Sensible heat factor.  
 e) Define sensible heating and dehumidification.

4 × 5

**PART-A**

- Q.2 a) Explain the comparison of refrigerants in detail.  
 b) Drive an expression of C.O.P of reversed carnot cycle with P-V and T-S diagram.

20

- Q.3 A simple evaporative air refrigeration system is used for an aero plane to take 20 tons of refrigeration load. The ambient air conditions are 20°C and 0.9 bar. The ambient air is rammed isentropically to a pressure of 1 bar. The air leaving the main compressor at pressure 3.5 bar is first cooled in the heat exchanger having effectiveness of 0.6 and then in the evaporator where temperature is reduced by 5°C. The air from the evaporator is passed through the cooling turbine and then it is supplied to the cabin which is maintained at a temperature of 25°C and a pressure of 1.05 bar. If the internal efficiency of compressor is 80% and that of cooling turbine is 75%, determine:  
 a) Mass of air bled off the main compressor.  
 b) Power required for the refrigerating system.  
 c) COP of the refrigerating system.

20

- Q.4 a) Describe the working of a steam jet refrigeration system with a neat sketch.  
 b) Explain the working of an electrolux system in detail.

10 × 2

**PART-B**

- Q.5 a) Draw a handmade sketch of psychometric chart with clear definition of each parameter.  
 b) Draw the heat balance of a room with brief description of source of heat.
- Q.6 Describe cooling and dehumidification process with a sketch of cooling coil and define the following:  
 a) Apparatus dew point (ADP).  
 b) Bypass factors with formula or mathematical expression.  
 c) Draining of condensate.

20

- Q.7 The following data refers to the office air conditioning plant having maximum seating capacity of 25 occupants:

Outside design conditions	-	34°C DBT, 28°C WBT.
Inside design conditions	-	24°C DBT, 50% Rh.
Solar heat gain	-	9120 W.
Latent heat gain per occupant	-	105 W.
Sensible heat gain per occupant	-	90 W.

Lighting load	-	2300 W.
Sensible heat load from other sources	-	11630 W.
Infiltration load	-	14m <sup>3</sup> /min.

Assuming 40% fresh air and 60% of recirculate air passing through the evaporator coil and the bypass factor of 0.15, find the dew point temperature of the coil and capacity of the plant.

20



**End Semester Examination, May 2017**  
**B. Tech.—Seventh Semester**  
**ALTERNATIVE FUELS AND ADVANCE IN IC ENGINES (M-824)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- What do you mean by high energy and power density batteries?
  - What are the safety aspects involved in the storage and handling of hydrogen?
  - What are the disadvantages associated with using alcohol as a fuel?
  - What is a hybrid vehicle?
  - What are the advantages offered by using bio diesel as an alternative fuel?
  - What do you mean by combustion stoichiometry?
  - What are hybrid operations in terms of engine fuels?
  - What does  $\Phi$  and  $\lambda$  represents in terms of IC engines?
  - How an adiabatic engine is different from a conventional engine?
  - Name the performance parameters involved in analysis of any IC engine fuel.  $2 \times 10$

**PART-A**

- Q.2 Explain the following:
- Lean burn engine.
  - Stratified charged engine.  $10 \times 2$
- Q.3 Write short notes on the following:
- Governing equations of engine simulation. 7
  - Closed loop control of engine parameters and hybrid operations. 7
  - Computer control of engine parameters for pollution control and better efficiency. 6
- Q.4 Explain the comparison of air standard cycle, fuel air cycle and the actual cycle along with the assumptions involved in each. 20

**PART-B**

- Q.5 Explain the following:
- Blending.
  - Trans esterification.
  - Octane number.
  - Cetane Number.  $5 \times 4$
- Q.6 Explain the important qualities of engine fuel with respect to:
- SI engine fuels.
  - CI engine fuels.  $10 \times 2$
- Q.7 Discuss about the performance and emission characteristics of:
- Methanol.
  - LPG.  $10 \times 2$

**End Semester Examination, May 2017**  
**B. Tech.–SeventhSemester**  
**MODERN MACHINING METHODS(M-835A)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) What is the need of modern machining methods?
  - b) Write the factors that affect the performance of WJM process.
  - c) State the function of acoustic head system used in USM.
  - d) What is self-adjusting feature of an ECM Process?
  - e) What is the chemical machining process?
  - f) State the various materials used as tool elements of EDM.
  - g) Compare EBM and LBM.
  - h) State the applications of PAM.
  - i) What is electrochemical spark machining process?
  - j) State the basic principle of wire cut EDM operation.
- 2x10

**PART-A**

- Q.2 Distinguish between conventional and unconventional machining process. Briefly explain the modern machining methods on the basis of machining characteristics, physical parameters and capability to shape. 20
- Q.3
- a) Explain the effect of the following factors on cutting rate in ultrasonic machining:
    - i) Grite size.
    - ii) Frequency of tool oscillation.
    - iii) Amplitude of tool oscillation.10
  - b) Explain with a neat diagram, the working of AJM. State the applications, advantages and limitations of AJM. 10
- Q.4
- a) Derive a theoretical relationship for the determination of the metal removal rate in ECM. Explain the advantages and limitations of ECM. 10
  - b) Explain the main steps of the CHM process. Explain the chemical blanking in brief. 10

**PART-B**

- Q.5
- a) What is elector discharge machining process? Sketch and explain the effects of following parameters on MRR during EDM:
    - i) Voltage
    - ii) Current density
    - iii) Pulse energy
    - iv) Capacitance.10
  - b) Derive a  
 n expression for the material removal rate of R – C relaxation circuit used for the EDM power supply. 10
- Q.6
- a) State the important parameters that influence the material removal rate in LBM. What are the main applications of LBM? 10
  - b) Describe with the help of a neat sketch the constructional features of an electron gun used for generating an electron beam in EMB. 10
- Q.7 Write short notes on following:
- a) Electro chemical honing. 10
  - b) Electro stream drilling. 10

**End Semester Examination, May 2017**  
**B. Tech.–First Semester**  
**APPLIED MATHEMATICS-I (MA-101A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1 a) Examine the convergence of  $\sum_{n=1}^{\infty} \frac{x^n}{(2n)!}$ .
- b) Find  $n^{\text{th}}$  differential coefficient of  $4^x$
- c) Expand  $\log(1+x)$  in powers of  $x$ .
- d) Find  $\lim_{(x,y) \rightarrow (0,1)} \tan^{-1}\left(\frac{y}{x}\right)$ .
- e) If  $u = \sin^{-1}\left[\frac{x+2y+3z}{\sqrt{x^8+y^8+z^8}}\right]$ , prove that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = -3 \tan u$ .
- f) Change the order of integration in  $\int_0^{\infty} \int_x^{\infty} \frac{e^{-y}}{y} dy dx$  and hence solve it.
- g) Evaluate:  $\beta(2.5, 1.5)$ .
- h) Show that  $\mathbf{v} = 3y^4 z^2 \hat{i} + 4x^2 z^2 \hat{j} + 3x^2 y^2 \hat{k}$  is solenoidal vector.
- i) Solve:  $(xy^2 - 4)dx + (x^2 y + 1)dy = 0$ .
- j) If  $x = r \cos \theta$ ,  $y = r \sin \theta$  then  
 Evaluate  $\left(\frac{\partial x}{\partial \theta}\right)_r, \left(\frac{\partial y}{\partial \theta}\right)_r, \left(\frac{\partial r}{\partial y}\right)_x, \left(\frac{\partial \theta}{\partial y}\right)_x$  2 × 10

**PART-A**

- Q.2 a) Discuss the convergence of the series:  
 $1 + \frac{x}{2} + \frac{2!}{3^2} x^2 + \frac{3!}{4^3} x^3 + \dots$  10
- b) Test the convergence and absolute convergence of the series:  $\sum_{n=2}^{\infty} (-1)^{n-1} \frac{n+2}{2^n+5}$ . 10
- Q.3 a) Compute the value of  $\sin(91^\circ)$  correct upto 4 decimal places. 10
- b) By forming a differential equation, expand  $y = \left[x + \sqrt{1+x^2}\right]^m$ . 10
- Q.4 a) If  $\frac{x^2}{a^2+u} + \frac{y^2}{b^2+u} + \frac{z^2}{c^2+u} = 1$  prove that  $\left(\frac{\partial u}{\partial x}\right)^2 + \left(\frac{\partial u}{\partial y}\right)^2 + \left(\frac{\partial u}{\partial z}\right)^2 = 2 \left(x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z}\right)$  10
- b) A space probe in the shape of the ellipsoid  $4x^2 + y^2 + 4z^2 = 16$ , enters Earth's atmosphere and its surface begins to heat. After 1 hour, the temperature at the point  $(x, y, z)$  on the probe's surface is  $T(x, y, z) = Kxyz^2$ . Find the hottest point on the probe's surface. 10

**PART-B**

- Q.5** a) Change the order of integration in  $I = \int_0^1 \int_{x^2}^{2-x} xy \, dx dy$  and hence evaluate. **10**
- b) Show that  $\int_0^\infty e^{-2x} x^{n-1} dx = \frac{\Gamma(n)}{2^n}$ . **5**
- c) Prove that  $\int_0^1 \frac{1}{2} = \sqrt{\pi}$  **5**
- Q.6** a) State and prove the physical interpretation of divergence. **10**
- b) If  $F = (2x^2 - 3z)\hat{i} - 2xy\hat{j} - 4x\hat{k}$ , then evaluate  $\iiint_V (\nabla \cdot F) dv$  where  $V$  is the closed region bounded by the planes:  
 $x=0, y=0, z=0$  and  $2x+2y+z=4$ . **10**
- Q.7** a) Solve:  $(D-2)^2 y = 8(e^{2x} + \sin 2x)$  **6**
- b) Find the complete solution of  $\frac{d^2 y}{dx^2} - 4y = x \sinh x$  **4**
- c) Solve the following simultaneous equations:  
 $\frac{d^2 y}{dt^2} + \frac{dy}{dt} - 2y = \sin t$   
 $\frac{dx}{dt} + x - 3y = 0$  **10**

**End Semester Examination, May 2017**  
**B. Tech.–Second Semester**  
**APPLIED MATHEMATICS-II (MA-201A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) If Eigen vector of  $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$  is  $\begin{bmatrix} 2 & -1 \end{bmatrix}^T$ , find the corresponding Eigen value.

b) Find rank of matrix  $A = \begin{bmatrix} 1 & 2 & 3 \\ -2 & -4 & -6 \\ 4 & 8 & 12 \\ \frac{1}{2} & 1 & \frac{3}{2} \end{bmatrix}$

c) Write the sufficient conditions for Fourier expansion.

d) Find Fourier sine series of  $f(x) = x$  in the interval,  $0 < x < \pi$ .

e) Form the partial differential equation of the following relation:  $z = f\left(\frac{xy}{z}\right)$ .

f) Find Laplace transform of  $f(t) = 2^t + t \sin t$ .

g) Find Inverse Laplace transform of  $F(s) = \frac{e^{-\pi s}}{s^2 + a^2} + \frac{1}{s^2}$ .

h) Test the continuity of  $f(z) = \begin{cases} \frac{z^3 - iz^2 + z - i}{z - i} & , z \neq i \\ 0 & , z = i \end{cases}$ .

i) Find the residue of  $f(z) = \exp\left(\frac{1}{z-i}\right)$ .

j) State the convolution theorem for Fourier transforms.

2 × 10

**PART-A**

Q.2 a) For what value of  $\lambda$  and  $\mu$  the system of equations  $2x + 3y + 5z = 9$ ;  $7x + 3y - 2z = 8$ ;  $2x + 3y + \lambda z = \mu$  have

i) No solution,

ii) Unique solution,

iii) Infinite number of solutions.

10

b) Find Eigen values and the corresponding Eigen vectors of the matrix  $A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ . 10

Q.3 a) Find Fourier expansion of  $f(x) = \frac{x^2}{4}$ ;  $-\pi \leq x \leq \pi$  and show that  $\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$ . 10

- b) Find the series of cosines of multiples of  $x$ , which will represent  $x \sin x$  in the interval  $(0, \pi)$  and show that

$$\frac{1}{1 \cdot 3} - \frac{1}{3 \cdot 5} + \frac{1}{5 \cdot 7} - \frac{1}{7 \cdot 9} = \frac{\pi - 2}{4} \quad 10$$

- Q.4 a) Solve the following differential equation

$$x(y-z)p + y(z-x)q = z(x-y) \quad 6$$

- b) Solve the following equation by Charpit's method

$$pxy + pq + qy = yz \quad 7$$

- c) Solve the following differential equation by method of separation of variables

$$\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u, \text{ given that}$$

$$u = 3e^{-y} - e^{-5y} \text{ when } x = 0. \quad 7$$

### **PART-B**

- Q.5 a) Determine the analytic function  $f(z) = u + iv$  where  $u - v = (x - y)(x^2 + 4xy + y^2)$ . 7

- b) Using Cauchy's Integral formula, Evaluate

$$\int_C \frac{e^{2z}}{(z+1)^4} dz; \text{ where } C \text{ is } |z| = 2. \quad 7$$

- c) Expand  $f(z) = \frac{1}{(z+1)(z+3)}$  about  $1 < |z| < 3$ . 6

- Q.6 a) Using Parseval's Identity, Evaluate

$$\int_0^\infty \frac{x^2 dx}{(a^2 + x^2)(b^2 + x^2)} \quad 10$$

- b) Find Fourier transform of  $f(x) = \begin{cases} 1 - x^2; & |x| < 1 \\ 0 & ; |x| > 1 \end{cases}$  and use it to evaluate

$$\int_0^\infty \left( \frac{x \cos x - \sin x}{x^3} \right) dx. \quad 10$$

- Q.7 a) Solve  $\frac{d^2 x}{dt^2} + \frac{9dx}{dt} = \cos 2t$ , by Laplace transform method subject to the conditions,

$$x(0) = 1, x\left(\frac{\pi}{2}\right) = -1. \quad 10$$

- b) State and prove convolution theorem for Laplace transform and hence evaluate

$$\frac{1}{s(s^2 + a^2)}. \quad 10$$

**End Semester Examination, May 2017**  
**B. Tech.–Second Semester**  
**APPLIED MATHEMATICS-II (MA-201A)**

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q. 1 is compulsory. Attempt any TWO questions from Part-A and TWO questions from Part-B. Each question carries equal marks.

- Q.1
- Define a unit step function.
  - The Fourier expansion of an odd function has only sine terms. (**True/False**)
  - Write one dimensional heat equation.
  - Give an example of a 3x3 matrix of rank 1.
  - Solve the differential equation  $p^2 + q^2 = 1$ .
  - Find the Laplace transform of  $5^t$ .
  - Find  $L^{-1}\left[\frac{e^{3s}}{s^2}\right]$ .
  - Write the period of  $f(x) = \cos x + \sin 2x$ .
  - Find the sum and product of the eigen values of  $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$ .
  - $\omega = \log z$  is analytic everywhere except at  $z = \underline{\hspace{2cm}}$ . 2x10

**PART-A**

- Q.2
- Find the characteristic roots and characteristic vectors of the matrix:  

$$A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$$
 10
  - Find the non-singular matrices P and Q such that PAQ is in the normal form for the matrix:  

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & -1 \end{bmatrix}$$
 6
  - Check whether the following vectors are linearly dependent or linearly independent.  
 $X_1 = (1, 1, 2, 3)$ ,  $X_2 = (1, 2, 3, 4)$ ,  $X_3 = (2, 3, 4, 9)$  4
- Q.3
- Expand  $f(x) = x \sin x$ ,  $0 < x < 2\pi$  as a Fourier series. 10
  - Find the Fourier series of the function  $f(x) = x + x^2$  in the interval  $(-\pi, \pi)$ . 10
- Q.4
- Solve:  $x(y-z)p + y(z-x)q = z(x-y)$ . 5
  - Solve:  $z^2(p^2 + q^2) = x^2 + y^2$  5
  - A tightly stretched flexible string has ends fixed at  $x=0$  and  $x=1$ . At time  $t=0$ , the string is given a shape defined by  $f(x) = \mu x(\ell - x)$ , where  $\mu$  is a constant and then released. Find the displacement at any point  $x$  of the string at any time  $t > 0$ . 10

**PART-B**

- Q.5 a) Show that the function  $u = \frac{1}{2} \log (x^2 + y^2)$  is harmonic and find its harmonic conjugate. 7
- b) Determine the pole of the function  $f(z) = \frac{z^2}{(z-1)^2(z+2)}$  and the residue at each pole. Hence evaluate  $\int_C \frac{z^2}{(z-1)^2(z+2)} dz$  where  $C$  is the circle  $|z|=3$ . 7
- c) Find Laurent's series about  $z = \pi$  for the function  $f(z) = \frac{\sin z}{z - \pi}$ . 6
- Q.6 a) State and prove convolution theorem for Fourier transforms. 5
- b) Using Parseval's identity, show that  $\int_0^\infty \frac{\sin^2 t}{t^2} dt = \frac{\pi}{2}$  5
- c) Find the Fourier cosine transform of  $e^{-x^2}$ . 10
- Q.7 a) Find  $L\{t^2 \sin 2t\}$ . 5
- b) Find  $L^{-1}\left\{\frac{s}{s^2 + 4s + 13}\right\}$ . 5
- c) Solve  $\frac{d^2 y}{dt^2} + 3\frac{dy}{dt} + 2y = \sin t$ , where  $y(0) = 0$ ,  $y'(0) = 1$ . 10



**End Semester Examination, May 2017**  
**B. Tech. – Third Semester**  
**QUANTITATIVE APTITUDE (MA-301)**

Time: 2 hrs.

Max Marks: 50

No. of pages: 4

Note: *The paper consists of FIFTY multiple choice questions; Each question has FOUR options with ONE correct answer. Select the correct answer. Attempt all questions. All questions are of ONE mark each. There is no negative marking. Calculator not allowed.*

- Q.1 If South-East becomes North, North-East becomes west and so on. What will West become?  
a) North-East      b) North-West      c) South-East      d) South-West
- Q.2 One morning after sunrise Nivedita and Niharika were talking to each other face to face at Dalphin crossing. If Niharika's shadow was exactly to the right of Nivedita, Which direction Niharika was facing  
a) North  
b) South  
c) East  
d) Data is inadequate
- Q.3 Debu walks towards East then towards North and turning  $45^\circ$  right walks for a while and lastly turns towards left. In which direction is he walking now?  
a) North      b) East  
c) South-East      d) North-West
- Q.4 Deepak said to Nitin, "The boy playing with the football is the younger of the two brothers of the daughter of my father's wife." How is the boy playing football related to Deepak?  
a) Cousin      b) Brother  
c) Son      d) Brother-in-law

- Q.5 Sia introduced Raghav as the son of the only daughter of the father of her uncle. How is Raghav related to Sia?  
a) Brother  
b) Cousin  
c) Nephew  
d) Can't be determined

**Directions for questions 6 to 10:** A cube painted red on two adjacent faces and black on the faces opposite to the red faces and green on the remaining faces, is cut into 64 smaller cubes of equal size.

- Q.6 How many cubes are there which have no face painted?  
a) 0      b) 4  
c) 8      d) 16
- Q.7 How many cubes have only one face painted?  
a) 8      b) 4  
c) 24      d) 32
- Q.8 How many cubes have less than three faces painted?  
a) 44      b) 24  
c) 48      d) 36
- Q.9 How many cubes are there with three faces painted?  
a) 4      b) 8  
c) 16      d) 24
- Q.10 How many cubes have one face green and one of the adjacent faces black or red?  
a) 8      b) 16  
c) 24      d) 28
- Q.11 In alphabet series, some alphabets are missing which are given in that order as one of the alternatives below it. Choose the correct alternative.  
\_ \_ aba \_ \_ ba \_ ab

- a) abbbba                      b) abbab  
c) baabb                        d) bbaba

Q.12 In the AMS club, all the members participate either in the Tambola or the Fete. 420 participate in the Fete, 350 participate in the Tambola and 220 participate in both. How many members does the club have?

- a) 410                              b) 550  
c) 440                              d) 140

Directions for questions 13-16: Refer to the data below and answer the questions that follow.

5% of the passengers, who boarded Guwahati-New Delhi Rajdhani Express on 20 February 2002, do not like coffee, tea and ice-cream and 10% like all the three, 20% like coffee and tea, 25% like ice-cream and coffee and 25% like ice-cream and tea. 55% like coffee, 50% like tea and 50% like ice-cream.

Q.13 The passengers who like only coffee is greater than the passengers who like only ice-cream by

- a) 50%                              b) 100%  
c) 25%                              d) 0

Q.14 The percentage of passengers who like both tea and ice-cream but not coffee is

- a) 15                                b) 5  
c) 10                                d) 25

Q.15 The percentage of passengers who like at least 2 of the 3 products is:

- a) 40                                b) 45  
c) 50                                d) 60

Q.16 If the number of passengers is 180, then the number of passengers who like ice-cream only is

- a) 10                                b) 18  
c) 27                                d) 36

Q.17 Which one will replace the question mark in the following figures.



- a) L<sub>10</sub>                                b) K<sub>15</sub>  
c) I<sub>15</sub>                                d) K<sub>8</sub>

Directions for questions 18 to 23: Study the following information and answer the questions: M, N, P, R, T, W, F and H are sitting around a circle facing at the centre. P is third to the left of M and second to the right of T. N is second to the right of P. R is second to the right of W who is second to the right of M. F is not an immediate neighbour of P.

Q.18 Who is to the immediate right of P?

- a) H                                b) F  
c) R  
d) Data inadequate

Q.19 Who is to the immediate right of H?

- a) R                      b) F  
c) M                      d) N

Q.20 Who is to the immediate left of R?

- a) P                      b) H  
c) W                      d) T

Q.21 Who is third to the right of H?

- a) T                      b) W  
c) R                      d) F

Q.22 Who is second to the right of F?

- a) M                      b) R  
c) T  
d) Data inadequate

Q.23 In which of the following is the first person sitting in between the second and the third person ?

- a) NHM                      b) PHN  
c) TRP                      d) TWF

Q.24 In a certain code language, 123 means "hot filter coffee", 356 means "very hot day" and 589 means "day and night". Then code for "very" is

- A.8                      B.6  
C.9                      D.5

Q.25



- a) 125                      b) 165  
c) 600                      d) 625

Directions for questions 26 to 28: On the basis of the information provided below, answer these questions:

Six people A, B, C, D, E and F are sitting on the ground in a hexagonal shape. All the sides of the hexagon so formed are of same length. A is not adjacent to B or C; D is not adjacent to C or E; B and C are adjacent; F is in the middle of D and C.

Q.26 Which of the following is not correct neighbourpair?

- a) A and F                      b) D and F  
c) B and E                      d) C and F

Q.27 Which of the following is in the right sequence?

- a) A, F, B                      b) F, A, E  
c) B, C, F                      d) D, A, B

Q.28 Who is placed opposite to E?

- a) B                      b) C  
c) D                      d) F

Q.29 Statements: All kings are warriors. All soldiers are warriors.

All sentries are warriors. Some sentries are soldiers.

Conclusions:

- I. Some sentries are kings.

- II. All warriors are soldiers.  
 III. Some warriors are sentries.  
 IV. Some soldiers are kings.  
 a) Only I follows  
 b) Only II follows  
 c) Only II and III follow  
 d) None of these

Q.30 In alphabet series, some alphabets are missing which are given in that order as one of the alternatives below it. Choose the correct alternative.

A \_ cdaab \_ cc \_ daa \_ bbb \_ ccddd

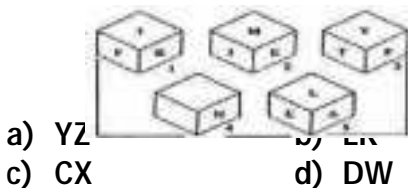
- a) bdbda                      b) bddca  
 c) dbbca                      d) bbdac

Q.31 In alphabet series, some alphabets are missing which are given in that order as one of the alternatives below it. Choose the correct alternative.

Ab \_ aa \_ bbb \_ aaa \_ bbba

- a) abba                      b) baab  
 c) aaab                      d) abab

Q.32 What letters are missing from cube 4?



- a) YZ                      b) LN  
 c) CX                      d) DW

Q.33 Veena who is the sister-in-law of Ashok is the daughter-in-law of Kalyani. Dheeraj is the father of Sudeep who is the only brother of Ashok. How Kalyani is related to Ashok?

- a) Mother-in-law                      b) Aunt  
 c) Wife                      d) Mother

Q.34 Introducing a woman, Shashank said, "She is the mother of the only daughter of my son." How that woman is related to Shashank?

- a) Daughter  
 b) Sister-in-law  
 c) Wife  
 d) Daughter-in-law

Q.35 K is 40 m South-West of L. If M is 40 m South-East of L, then M is in which direction of K?

- a) East                      b) West  
 c) North-East                      d) South

Q.36 Sia introduced Raghav as the son of the only daughter of the father of her uncle. How is Raghav related to Sia?

- a) Brother  
 b) Cousin  
 c) Nephew  
 d) can't be determined

**Directions for question 37 – 38**

Each of these questions is based on the following information:

M % N means M is the son of N.

M @ N means M is the sister of N.

M \$ N means M is the father of N

Q.37 Which of the following shows the relation that C is the granddaughter of E?

- a) C % B \$ F \$ E    b) B \$ F \$ E % C  
c) C @ B % F % E    d) E % B \$ F \$ C

Q.38 Which of the following shows the relation that S is the father of Q?

- a) S @ P \$ Q    b) Q @ P % S  
c) Q \$ S @ P    d) None of these

**Directions for questions 39 to 43:** A cuboid is painted with black color on opposite faces, red on other set of opposite faces and green on the remaining faces. This cuboid has been cut into 72 cubes in such a manner that 64 cubes all of equal size are smaller in size as compared to 8 equal sized large cubes. The black paint is on the smaller faces of cuboid.

Q.39 How many cubes will have only 1 face painted?

- a) 16    b) 20  
c) 24    d) 28

Q.40 How many cubes will have only 2 faces painted?

- a) 8    b) 16  
c) 20    d) 24

Q.41 How many cubes will have only 3 faces painted?

- a) 0    b) 4  
c) 8    d) 24

Q.42 How many cubes will have atleast 2 faces painted?

- a) 16    b) 28  
c) 32    d) 40

Q.43 How many cubes will have no face painted?

- a) 4    b) 8  
c) 12    d) 32

Q.44 Rahul put his timepiece on the table in such a way that at 6 p.m. hour-hand points to North. In which direction the minute-hand will point at 9.15 p.m.?

- a) South-East    b) South  
c) North    d) West

Q.45 B is the brother of A, S is the sister of B, E is the brother of D, D is the daughter of A, F is the father of S. Then, the uncle of E is

- a) A    b) F  
c) B    d) D

Q.46 If the total number of dots on opposite faces of a cubical block is always 7, find the figure which is correct.



- a) a    b) b

c) c

d) d

Q.47 Pointing to Gopi, Nalni Says, "I am the daughter of the only son of his grandfather." How Nalni is related to Gopi?

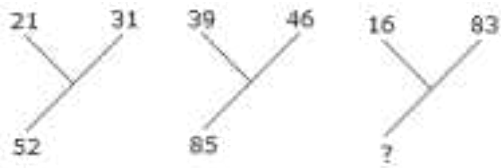
a) Niece

b) Daughter

c) Indeterminable

d) Sister

Q.48



a) 115

b) 99

c) 89

d) 140

Directions for questions 49 to 50: A, B, C, D, E, F, and G are travelling in three different vehicles. There are at least two passengers in each vehicle - I, II, and III and each vehicle has passengers of both the sexes. There are two engineers, two doctors and three teachers among them. C is a lady doctor and she does not travel with the pair of sisters A and F. B, a male engineer, travels with only G, a teacher in vehicle I. D is a male doctor. Two persons belonging to same profession do not travel in the same vehicle. A is not an engineer and travels in vehicle II. People from same family travel in same vehicle.

Q.49 In which vehicle does C travel?

a) I

b) II

c) III

d) II or III

Q.50 What is F's profession?

a) Doctor

b) Engineer

c) Data inadequate

d) Teacher

**End Semester Examination, May 2017**  
**B. Tech.– Third Semester**  
**APPLIED MATHEMATICS -III (MA-341A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1
- Find  $\frac{dy}{dx}$ ,  $y = \frac{2x^2 + 3x + 4}{\sqrt{x}}$
  - Find  $\frac{dy}{dx}$ ,  $y = (\log x)^x$
  - Evaluate  $\int \tan^2 x dx$
  - Evaluate  $\int \cos^4 x dx$
  - Find  $\frac{\partial u}{\partial x}$ , if  $u = \cos^{-1}\left(\frac{x}{y}\right)$
  - If  $x = r \cos \theta$ ,  $y = r \sin \theta$   
show that  $\frac{\partial r}{\partial x} = \frac{\partial x}{\partial r}$
  - Expand  $e^x$  in power of  $(x-2)$
  - Evaluate  $\left| \frac{1}{2} \right|$ .
  - Find grad  $\phi$  if  $\phi = x^2 + yz$
  - Change the order of integration  $\int_0^{4a} \int_{\frac{x^2}{4a}}^{2\sqrt{ax}} dy dx$ . 2 × 10

**PART-A**

- Q.2
- Find  $\frac{dy}{dx}$ ,  $y = \cos(\sin x^2)$  6
  - Find  $\frac{dy}{dx}$ ,  $y = \frac{e^x}{1 + \sin x}$  6
  - If  $y = e^{ax} \sin bx$  show that  $\frac{d^2 y}{dx^2} - 2a \frac{dy}{dx} + (a^2 + b^2)y = 0$  8
- Q.3
- Evaluate  $\int \frac{x^4}{x+1} dx$ . 5
  - Evaluate  $\int \frac{(\tan^{-1} x)^2}{1+x^2} dx$ . 7
  - Evaluate  $\int \frac{dx}{5-8x-x^2}$  8
- Q.4
- If  $u = \log(x^3 + y^3 + z^3 - 3xyz)$



Show that  $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)u = \frac{-9}{(x+y+z)^2}$  10

b) If  $u = \frac{x}{y-z}$ ,  $v = \frac{y}{z-x}$ ,  $w = \frac{z}{x-y}$

Show that  $\partial\left(\frac{u,v,w}{x,y,z}\right) = 1/4$  10

### **PART-B**

- Q.5 a) Expand  $\log(1+x)$  by Maclaurin's Series. 10  
 b) Show that the rectangular solid of Maximum volume that can be inscribed in a given sphere is a cube. 10

- Q.6 a) Evaluate  $\iint_D e^{-(x^2+y^2)} dy dx$  where  $D$  is the region bounded by  $x^2 + y^2 = a^2$  10  
 b) Deduce the relation between Beta and Gamma function. 10

- Q.7 a) Find the directional derivative of  $\phi = 5x^2y - 5y^2z + \frac{5}{2}z^2x$  at point  $P(1,1,1)$  in the direction of the line  $\frac{x-1}{2} = \frac{y-3}{-2} = \frac{z}{1}$  10  
 b) Compute line integral  $\int_C y^2 dx - x^2 dy$  about the triangle whose vertices are  $(1,0)$ ,  $(0,1)$  and  $(-1,0)$  10

**End Semester Examination, May 2017**  
**B. Tech.–Third Semester**  
**APPLIED MATHEMATICS(MA-341A)**

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1 a) If  $y = \frac{\sin^{-1} x}{\sqrt{1-x^2}}$ , find  $\frac{dy}{dx}$ .
- b) Evaluate:  $\int_3^4 (y + e^y) dy$ .
- c) If  $u = \cos^{-1}\left(\frac{x}{y}\right)$ , find  $\frac{\partial u}{\partial x}$  and  $\frac{\partial u}{\partial y}$ .
- d) If  $u = \sin^{-1} \frac{x}{y} + \tan^{-1} \frac{y}{x}$ , then find  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \text{-----}$ .
- e) If  $x^y + y^x = c$ , find  $\frac{dy}{dx}$ .
- f) If  $x = r \cos \theta$ ,  $y = r \sin \theta$ , find  $\frac{\partial(x, y)}{\partial(r, \theta)}$ .
- g) The necessary conditions for  $f(x, y)$  to have a maximum or minimum is -----.
- h) Value of  $\int_0^{\pi/2} \sin^m \theta \cos^n \theta d\theta = \text{-----}$ .
- i) If  $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$ , show that  $\text{div } \vec{r} = 3$ .
- j) Define 'directional derivative'. 2x10

**PART-A**

- Q.2 a) Given  $y = e^x + 3\cos x + 2\log x$ , find  $\frac{dy}{dx}$ . 5
- b) Differentiate  $\sqrt{\cos \sqrt{x}}$ . 5
- c) If  $y = \log(1 + \cos x)$ , prove that  $y_1 \cdot y_2 + y_3 = 0$ . 10
- Q.3 a) Solve the following integrals:
- i)  $\int_{-3}^3 |x+1| dx$  4
- ii)  $\int \frac{2x+5}{x^2-x-2} dx$  6
- b) Solve:  $\int_0^{\pi/2} x^2 \sin x dx$  10
- Q.4 a) If  $x^x y^y z^z = c$ ; show that at  $x = y = z$ ,  $\frac{\partial^2 z}{\partial x \partial y} = -(x \log ex)^{-1}$ . 10
- b) If  $u = \frac{yz}{x}$ ,  $v = \frac{zx}{y}$ ,  $w = \frac{xy}{z}$ ; show that  $\frac{\partial(u, v, w)}{\partial(x, y, z)} = 4$ . 10

**PART-B**

- Q.5 a) Find Maclaurin's series expansion of  $\tan^{-1} x$ . 10  
 b) Examine for minimum and maximum values of:  
 $\sin x + \sin y + \sin(x + y)$  10
- Q.6 a) Write the definition of Beta function and prove that  $\beta(m, n) = \beta(n, m)$ . 7  
 b) Change the order of integration of  $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dx dy$  and hence solve. 7  
 c) Evaluate the double integral,  $\int_{x=0}^1 \int_{y=x^2}^x (x^2 y + xy^2) dy dx$ . 6
- Q.7 a) The velocity vector is  $\vec{F} = y\hat{i} + 2z\hat{j} + xz\hat{k}$ , show that the flux of water through the parabolic cylinder  $y = x^2$ ;  $0 \leq x \leq 3$ ,  $0 \leq z \leq 2$  is  $69 \text{ m}^3 / \text{sec}$ . 10  
 b) Prove that  $\text{div}(\text{grad } r^n) = n(n+1)r^{n-2}$ . 10

**End Semester Examination, May 2017**  
**B. Tech. (Biotechnology)— Fourth Semester**  
**BIOSTATISTICS (MA-401)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

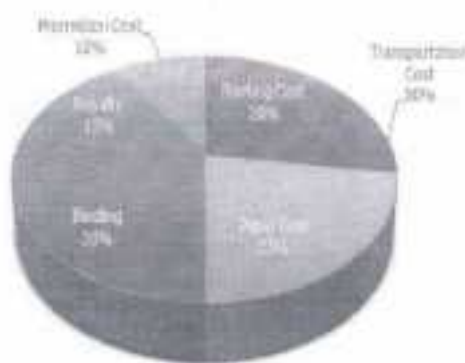
Q.1 Answer briefly the following:

- What is the difference between a scatter plot and dot plot?
- When should one use binomial distribution? Give its equation.
- What is the null hypothesis for T test for a paired sample? Give the equation for the T test for paired sample.
- Differentiate between ANOVA and T-test.
- What is interpolating and extrapolating? Explain with an example.

4 × 5

**PART-A**

- Q.2 a) The following pie-chart shows the percentage distribution of the expenditure incurred in publishing a book. Study the pie-chart and answer the questions based on it. What is the central angle of the sector corresponding to the expenditure incurred on binding, paper cost and royalty?



10

- b) Draw the line graph for the following data:

Day	1	2	3	4	5	6
Temperature(°C)	43	38	41.5	42	39	37

5

- c) Write short notes on frequency graphs and Histograms.

5

- Q.3 a) The heights of the players (in centimeters) from a basketball team are represented by the table. Calculate the mean and standard deviation of the given data:

Height	1.725	1.775	1.825	1.875	1.925	1.975
Frequency	1	3	4	8	5	2

12

- b) Explain different type of kurtosis diagrammatically.

8

- Q.4 a) Explain rule of subtraction, multiplication and addition in probability. 10
- b) In a class, there are 15 boys and 10 girls. Three students are selected at random. What is the probability that 1 girl and 2 boys are selected? 10

**PART-B**

- Q.5 a) What are the different types of sampling? Explain briefly.

10

- b) Carry out the T test and interpret the result for the following data, given  $\alpha = 0.025$   
 $t_{\text{theoretical}} = 2.045$ .

65	67	75	77	69	65	73	78	70	72	73	79	68	73	71
83	75	72	76	78	80	72	81	70	78	77	71	87	70	75

10

- Q.6 a) Differentiate between 'parametric' and 'non-parametric' tests. 6  
 b) What are the different types of ANOVA? Explain. 10  
 c) Explain Wilcoxon test. 4

- Q.7 a) What does correlation mean? How is it related to 'r'? Explain. 10  
 b) Calculate the spearman's correlation coefficient for the following data:

10	9	8	7	6	5	4	3	2	1
2	3.5	1	6	6	3.5	9	10	6	8

10

**End Semester Examination, May 2017**  
**B. Tech.–Fourth Semester**  
**APPLIED MATHEMATICS-IV (MA-441A)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1 a) Find eigen values and eigen vectors of the matrix  $A = \begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$ . 4
- b) Find Fourier sine series for the function  $f(x) = 1$  in  $(0, \pi)$ . 3
- c) Solve  $p^3 - q^3 = 0$ . 2
- d) Find Laplace Transform of  $\frac{\sin at}{t}$ . 3
- e) Write convolution theorem for Fourier transform. 3
- f) Find complete solution of  $\frac{d^3 y}{dx^3} + y = 0$ . 4
- g) Write the formula for Laplace transform of  $t^n$ . 1

**PART-A**

- Q.2 a) Solve  $(D^4 - 1)y = e^x \cos x$ ; where  $D = \frac{d}{dx}$ . 10
- b) Solve  $\frac{dx}{dt} + y = \sin t$ , given that  $x = 2, y = 0$  when  $t = 0$ .  
 $\frac{dy}{dt} + x = \cos t$ , 10

- Q.3 a) Evaluate the integral  $\int_0^\infty t^3 e^{-t} \sin t$ , using Laplace transforms. 5
- b) Find  $L(a^t + t^3)$ , where L in the Laplace transform. 5
- c) Find  $L^{-1} \left[ \frac{5s+3}{(s-1)(s^2+2s+5)} \right]$ . 10

- Q.4 a) Find the rank of the matrix A:  

$$A = \begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$$
 10
- b) Solve the following system of equations by matrix method:  
 $x + y + z = 8,$   
 $x - y + 2z = 6$   
 $3x + 5y - 7z = 14.$  10

**PART-B**

- Q.5 a) Expand  $f(x) = e^{-x}$  as a Fourier series in the interval  $(-1, 1)$ . 10
- b) Find the half range cosine series for the function  $f(x) = (x-1)^2$  in the interval  $0 < x < 1$ . Hence show that

$$\pi^2 = 8 \left( \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots \right). \quad 10$$

**Q.6 a) Solve the following partial differential equations:**

i)  $(y+z)p + (z+x)q = x+y$  **6**

ii)  $zpq = p+q$  **4**

**b) Solve  $px + qy - pq = 0$  by Charpit's method, where  $p = \frac{\partial z}{\partial x}$  and  $q = \frac{\partial z}{\partial y}$ .** **10**

**Q.7 a) Using the Fourier integral transform, show that**

$$\int_0^\infty \frac{\lambda \sin \lambda x}{1 + \lambda^2} d\lambda = \frac{\pi}{2} e^{-x}, x > 0. \quad 10$$

**b) Find the Fourier sine transform of  $\frac{e^{-ax}}{x}$ .** **10**

# End Semester Examination, May 2017

B. Tech.–Fifth/ Sixth Semester

## NUMERICAL METHODS AND OPTIMIZATION TECHNIQUES (MA-501)

Time: 3 hrs.

Max Marks:100

No. of pages:2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- Write the normal equations to fit a straight line  $y = mx + c$  to  $n$  observations. 3
  - Solve  $x + y = 2$  and  $2x - 3y = 5$  by Gauss-elimination method. 3
  - Write Newton's iterative formula to find the value of  $N^{\frac{1}{3}}$ . 3
  - Write trapezoidal integration formula for the integration of  $y = f(x)$ . 3
  - State Euler's method for solving  $y' = f(x, y)$  with  $y(x_0) = y_0$ . 3
  - Write the canonical form of linear programming problem. 3
  - Define 'interpolation and extrapolation'. 2

### PART-A

- Q.2 a) Using Newton's forward formula, find the value of  $f(1.6)$  if,

$x:$	1	1.4	1.8	2.2
$f(x):$	3.49	4.82	5.96	6.5

10

- b) Fit a curve of the form  $y = ax^b$  to the data:

$x:$	1	2	3	4	5	6
$y:$	1200	900	600	200	110	50

10

- Q.3
- Find a root of the equation  $x^3 - 2x - 5 = 0$  using secant method correct to three decimal places. 10
  - Find the positive root of  $x^4 - x = 10$  correct to three decimal places, using Newton Raphson method. 10

- Q.4 a) Apply Gauss Jordan method to solve the equations:

$$x + y + z = 9$$

$$2x - 3y + 4z = 13$$

$$3x + 4y + 5z = 40$$

10

- b) Solve the following system of equations by Gauss Jacobi method:

$$x + y + 54z = 110$$

$$27x + 6y - z = 85$$

$$6x + 15y + 2z = 72$$

Correct upto two decimal places.

10

### PART-B

- Q.5 a) Given that:

$x:$	1.0	1.1	1.2	1.3	1.4	1.5	1.6
$y:$	7.989	8.403	8.781	9.129	9.451	9.750	10.031

Find  $\frac{dy}{dx}$  at  $x = 1.1$

10



b) Evaluate  $\int_0^2 e^{-x^2} dx$ , using Simpson's  $\frac{1}{3}$  rule.

(take  $h=0.25$ )

10

Q.6 Using R-K method of 4<sup>th</sup> order find  $y(0.2)$  given that  $\frac{dy}{dx} = 3x + \frac{y}{2}$ ,  $y(0) = 1$

taking  $h = 0.1$

20

Q.7 Maximize  $z = 107x_1 + x_2 + 2x_3$

Subject to the constraints:

$$14x_1 + x_2 - 6x_3 + 3x_4 = 7$$

$$16x_1 + \frac{1}{2}x_2 - 6x_3 \leq 5$$

$$3x_1 - x_2 - x_3 \leq 0$$

$$x_1, x_2, x_3, x_4 \geq 0$$

Show that the solution of this problem is unbounded.

20

**End Semester Examination, May 2017**  
**M.Tech. (Industrial Engineering) -Second Semester**  
**FLEXIBLE MANUFACTURING SYSTEM (M-IE-203)**

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: *Attempt any FIVE questions in all. Each question carries equal marks.*

- |     |   |    |
|-----|---|----|
| Q.1 | a) Compare FMS and FMC.   | 5  |
|     | b) Define CIM Technology.   | 5  |
|     | c) Define different areas of application of a FMS in a Industry.                          | 5  |
| Q.2 | Explain bus type communication network in detail.   | 15 |
| Q.3 | Explain tool preset, identification and tool transfer in detail.                          | 15 |
| Q.4 | Define the method of grouping "Production flow Analysis".                                 | 15 |
| Q.5 | Explain SCARA configuration in detail.  | 15 |
| Q.6 | a) Define in detail the function of An FMS Host Computer.                                 | 10 |
|     | b) What are the data sets which are required to be exchange in FMS between FMS computers? | 5  |

**End Semester Examination, May 2017**  
**M. Tech.–Second Semester**  
**QUALITY CONTROL TECHNIQUE (M-IE-205)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Briefly describe the following:

- a) Reliability.
- b) Defect and defective.
- c) Process capability.
- d) Central limit theorem.
- e) Factorial design.
- f) Interaction between factors in experiments.
- g) Six sigma.
- h) Scatter diagram.
- i) Histogram.
- j) Quality assurance.

1½ × 10

**PART-A**

- Q.2 a) What are quality costs? Explain them with their categories and sub-categories. 10  
 b) Describe PDCA cycle in quality improvement. 5
- Q.3 a) Briefly describe types of control charts. 7  
 b) Control charts for  $\bar{x}$  and  $\sigma$  are maintained on the weight in kg of the contents of a certain container. The sub-group size is 10. The values of  $\bar{x}$  and  $\sigma$  are computed for each subgroup. After 18 subgroups,  $\Sigma\bar{x} = 595.8$  and  $\Sigma\sigma = 8.24$ .  
 Assuming the process to be in control, compute the upper and lower control limits of  $\bar{x}$  and  $\sigma$  charts. Also, compute the value of  $\sigma$ . 8
- Q.4 a) Describe the three step approach for product and process design in off-line quality control. 10  
 b) Explain types of noise factors in experiments. 5

**PART-B**

- Q.5 a) Briefly explain Juran's Trilogy. 8  
 b) Describe the basic steps in application of six sigma-DMAIC. 7
- Q.6 a) Describe basic procedure of making control charts and enumerate out of control signals. 8  
 b) Explain fault tree analysis with a suitable example. 7
- Q.7 Explain the eight fundamental management principles of ISO 9000. 15

**End Semester Examination, May 2017**  
**M. Tech. – Second Semester**  
**OPTIMIZATION TECHNIQUES (M-IE-206)**

Time: 3 hrs.

Max Marks: 75

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) What is integer linear programming?
  - b) State the cutting plane methods.
  - c) Define 'separable programming problems'.
  - d) State Lemke's algorithm.
  - e) What is meant by quadratic programming?
  - f) State Bellman's principle of optimality.
  - g) State Kuhn-Tucker necessary conditions.
  - h) What do you understand by the problem of sequencing?
  - i) Explain the basic logic of arrow networks.
  - j) What is float?

1½ × 10

**PART-A**

- Q.2 Solve the following integer programming problem using the Branch and Bound method:

Maximize  $z = 5x_1 + 4x_2$ .

Subject to be constraints:

- i)  $x_1, x_2 \leq 5$
- ii)  $10x_1 + 6x_2 \leq 45$   
 $x_1, x_2 \geq 0$  and integers.

15

- Q.3 Use the Kuhn-Tucker conditions to solve the following non-linear problems. Determine the values of  $x_1, x_2$  and  $z$ .

Maximize  $z = 12x_1 + 21x_2 + 21x_1x_2 - 2x_1^2 - 2x_2^2$ .

Subject to be constraints:

- i)  $x_2 \leq 8$ .
- ii)  $x_1 + x_2 \leq 0$  and  $x_1 + x_2 \geq 0$ .

15

- Q.4 Solve the following quadratic programming problem using Wolfe's method and determine the values of  $x_1, x_2$  and  $z$ .

Maximize  $z = 4x_1 + 6x_2 - 2x_1^2 - 2x_1x_2 - 2x_2^2$ .

Subject to be constraints:

- $x_1 + 2x_2 \leq 2$  and  $x_1, x_2 \geq 0$ .

15

**PART-B**

- Q.5
- a) Define the following dynamic programming terms:
    - i) Stage.
    - ii) State variable.
    - iii) Decision variable.
    - iv) Optimal return.
  - b) Use dynamic programming to find the value of  $y_1, y_2, y_3$  and  $z$ .

2 × 4

Maximize  $z = y_1 \cdot y_2 \cdot y_3$ .

Subject to be constraints:

$$y_1 + y_2 + y_3 = 5 \text{ and } y_1, y_2, y_3 \geq 0$$

7

- Q.6 a) Explain the principle assumptions made while dealing with sequencing problems. 5  
 b) Find an optimal sequence for the following sequencing problems of four jobs and five machines, when passing is not allowed. Its processing time (in hours) is given below:

Job	Machine				
	M <sub>1</sub>	M <sub>2</sub>	M <sub>3</sub>	M <sub>4</sub>	M <sub>5</sub>
A	7	5	2	3	9
B	6	6	4	5	10
C	5	4	5	4	8
D	8	3	3	2	6

Also find the total elapsed time and idle time of each machine.

10

- Q.7 A project schedule has the following characteristics:  
 a) Draw a project network.  
 b) Find the expected duration and variance of each.  
 c) Identity the critical path and the expected project.  
 d) What is the probability of completing the project in 30 days schedule time?  
 e) What is the probability that the project will complete in 3 days earlier than expected?  
 f) What is the probability that the project will not be completed 1 day later than expected?  
 g) What due date has 90% chance of being met?

Activity	Most likely time (m)	Optimistic time (a)	Pessimistic time (b)
1-2	2	1	3
2-3	2	1	3
2-4	3	1	5
3-5	4	3	5
4-5	3	2	4
4-6	5	3	7
5-7	5	4	6
6-7	7	6	8
7-8	4	2	6
7-9	6	4	8
8-10	2	1	3
9-10	5	3	7

15

**End Semester Examination, May 2017**  
**M. Tech. (Industrial Engineering)–SecondSemester**  
**HUMAN RELATIONS (M-IE-222)**

Time: 3 hrs.

Max Marks:75

No. of pages:1

Note: *Attempt FIVE questions in all;Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1    a) What are the main objectives of Human Resource Management?  
           b) What are the criteria for assessing performance?  
           c) What are impediments to effective training?  
           d) Define 'Incentives'. What are their advantages and disadvantages?  
           e) What is selection? Write its importance. 3×5

**PART-A**

- Q.2    How does culture influence the human resource function? 15
- Q.3    How performance appraisal can contribute to firm's competitive advantage? 15
- Q.4    What is need for evaluation of training programme? Briefly describe the principles of evaluation and techniques of evaluation. 15

**PART-B**

- Q.5    What is motivation? Why is it a critical issue of interest to managers in organizations? 15
- Q.6    What is meant by participative management? Write its importance and limitations. 15
- Q.7    What are the two most important challenges of Human Resource managers in future? Why? 15

**End Semester Examination, May 2017**  
**M. Tech - Second Semester**  
**MANAGEMENT INFORMATION SYSTEM(M-IE-301)**

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) What are different types of information?
  - b) What is the purpose of MIS?
  - c) Explain data flow diagram.
  - d) Explain different approaches used for system development.
  - e) Explain briefly network technologies.
  - f) What is classical model of decision making?
  - g) What are different techniques for assessing info?
  - h) Explain briefly the term ISDN.
  - i) What is production system?
  - j) What is transaction processing?
- 1½x10

**PART-A**

- Q.2
- a) Explain the architecture of MIS, giving detailed components and models. 7
  - b) Explain the steps involved in design, development and implementation of MIS. 8
- Q.3
- a) How is MIS different from DSS? How will you develop the DSS model by using different techniques? 7
  - b) How do you classify 'Network'? What is the importance of TCP/IP in Network? 8
- Q.4
- a) Write short notes on:
    - i) HTTP.
    - ii) BPO.
    - iii) Objectives of ITES.

3x3
  - b) What are the roles and responsibilities of system analyst? 6

**PART-B**

- Q.5
- a) What are basic steps in effective decision making? 6
  - b) Write short notes on:
    - i) Decision making tools and techniques.
    - ii) Herbert Simon Model.
    - iii) Geographic info system. (GIS)

3x3
- Q.6
- What do you understand by Data Base Management System? Explain its types and objectives in details. 15
- Q.7
- Describe the concept of Data Warehousing? Discuss the need of data warehousing in modern business. 15

**End Semester Examination, May 2017**  
**B.Tech. (Industry Integrated)– Fifth Semester**  
**PRODUCT DESIGN (MII-501)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) What is meant by parting line in molds?
  - b) What is meant by ejector pins in HPDC?
  - c) What is meant by web thickness in sheet metal parts?
  - d) What does the burr location indicate in sheet metal parts?
  - e) What is meant by reliability of parts?
  - f) What is meant by flash in forging parts?
  - g) Is electricity cost a fixed cost or a variable cost?
  - h) What is Mean time before failure?
  - i) What is meant by Mean time to failure?
  - j) How does the material flow inside HPDC Die? Draw material path. 2x10

**PART-A**

- Q.2
- a) What are the economic considerations in product design? 10
  - b) Describe the stages of a product life cycle in detail. 10
- Q.3
- a) Draw bath tub curve and describe its various stages in detail. 10
  - b) What are the steps in value engineering? 10
- Q.4
- a) How do you define breakeven point? Describe it with curve. 10
  - b) The fixed cost of a Bumper plant is Rs 50 lacs. Its variable cost is Rs 35/- per part. The sales volume is 40,000 per year. What should be the price for the breakeven point? 10

**PART-B**

- Q.5
- a) Describe the process of HPDC in detail. 10
  - b) What are the design considerations in HPDC parts? 10
- Q.6
- a) Write the considerations to make a product easy to use. How can one make it user friendly to cause minimum tiredness? 10
  - b) Describe the closed die forging process in detail. 10
- Q.7
- a) Explain the advantages of Kanban system. How does it function? 10
  - b) Describe two techniques of sterilolithography. 10



**End Semester Examination, May 2017**  
**B.Tech. (Industry Integrated)– Fifth Semester**  
**MEASURING TECHNIQUES AND COMPUTER AIDED INSPECTION**  
**(MII-502)**

Time: 3 hrs

Max Marks:100

No. of pages: 1

Note: *Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1    a) What is the use of surface gauge?  
        b) What is the use of Taper scale?  
        c) Discuss the principle of sine bar & its uses.  
        d) Discuss benefits of no-contact type instruments.  
        e) What are the advantages of using laser in measurement?  
        f) Define 'hole base system'.  
        g) Define 'shaft base system'.  
        h) What is a solar cell?  
        i) Define 'sensors'.  
        j) What do you understand by LED? 2x10

**PART-A**

- Q.2    a) Explain the working of sine bar and angle gauge. 10  
        b) What do you understand by linear measurement? Discuss Vernier scale. 10
- Q.3    a) Describe calibration process. 5  
        b) Discuss surface measurement using autocollimator. 15
- Q.4    What are the various surface roughness measurement methods and explain any one method with neat sketch? 20

**PART-B**

- Q.5    a) Discuss the principle and applications of optoelectronic devices. 10  
        b) What are off line and online inspection procedures? 10
- Q.6    a) Discuss integration and evaluation of data in CMM. 10  
        b) Discuss the principle of non – contact sensors. 10
- Q.7    Explain proximity sensors. What are the different types of proximity sensors and their applications? 20

**End Semester Examination, May 2017**  
**B.Tech. (Industry Integrated) – Fifth Semester**  
**FACILITY PLANNING AND PLANT LAYOUT (MII-503)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) Define a 'multi facility location layout'.
  - b) Define a 'warehouse'.
  - c) Define 'process layout'.
  - d) Define a 'material flow chart'.
  - e) Define 'chain type structure for part coding'.
  - f) Define 'assembly line'.
  - g) Define 'ta

kt time'.

- h) What are the shortcomings of a belt conveyor?
- i) Define 'vibratory conveyors'.
- j) Define 'apron conveyors'.

2x10

**PART-A**

- |     |   |    |
|-----|---|----|
| Q.2 | a) What are the characteristics of a good facility layout?              | 6  |
|     | b) Discuss various methods to analyse location for a facility.          | 14 |
| Q.3 | Define a plant layout. What are the different types of plant layouts?   | 20 |
| Q.4 | a) What do you understand by group technology and how it is beneficial? | 5  |
|     | b) Discuss various grouping techniques?                                 | 15 |

**PART-B**

- |     |  |    |
|-----|--|----|
| Q.5 | a) What is flow planning criteria?   | 5  |
|     | b) What are the principles of material handling system?  | 15 |
| Q.6 | a) What are the safety considerations in material handling?  | 10 |
|     | b) Classify the various material handling equipments?  | 10 |
| Q.7 | Explain automated storage and retrieval system and its types. Also discuss the objectives and advantages of AS/RS systems in detail. | 20 |

**End Semester Examination, May 2017**  
**B.Tech. (Mechanical Engg. Industry Integrated) –FifthSemester**  
**COMPUTER AIDED DESIGN (MII-504)**

Time: 3 hrs

Max Marks:100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- What is .igs format?
  - How can you trim one line with the other line?
  - How can you make a plane using planar curve?
  - What is meant by CAM?
  - What is planar surface?
  - How will you change the color of a part?
  - What is meant by revolved surface?
  - What is bi linear surface?
  - How will you make circle in sketcher?
  - How will you make curve in sketching mode?
- 2x10

**PART-A**

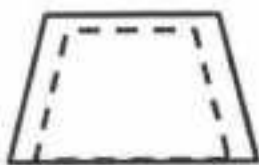
- Q.2
- What is meant by associativity? How is useful? 5
  - How can you make three equidistant points on a line?



- What is meant by overconstrained geometry? How is it indicated in CATIA? 5  
10

- Q.3
- What is meant by CAD? How is it useful? What is the difference between 2D and 3D CAD? 10
  - Describe the methodology to make the model of a spoon. 10

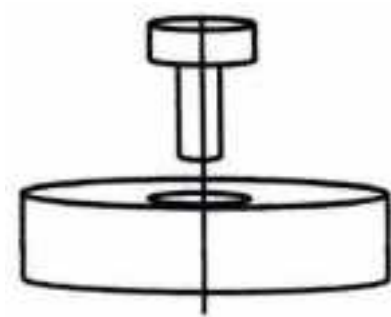
- Q.4
- The following is the plastic part. The right figure shows the core. Describe the method of making the core model. How can you incorporate the shrinkage allowance in it?



- Describe the way of making the solid model for a gear. 10  
10

**PART-B**

- Q.5
- Describe the different types of transformation features used in CAD modeling. 10
  - What are the various types of surfaces that are used in CAD modeling? 10
- Q.6
- What is meant by top down assembly modeling? What are the different steps in doing this type of assembly modeling? 10
  - How can you make an assembly model using bottom up assembly modeling approach in CATIA?



10

**Q.7** You have a 3D model and you have to create 2D drawings from it. Describe the method of view generation, dimensioning and changing scale while using CATIA. **20**

**End Semester Examination, May 2017**  
**B.Tech. (Industry Integrated) –FifthSemester**  
**JIGS AND FIXTURE DESIGN(MII-505)**

Time: 3 hrs

Max Marks: 100

No. of pages: 2

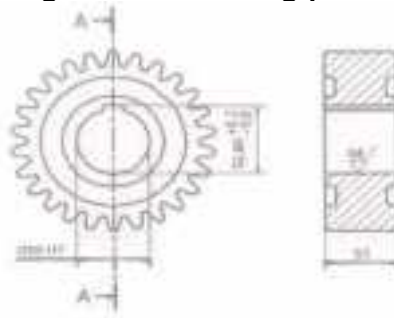
Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- What is meant by press fit?
  - What is meant by transition fit?
  - What is taper dowel?
  - Draw the diagram of a equalizing clamp.
  - Draw the diagram of a cam clamp.
  - What is meant by minimum material condition?
  - What is meant by cycle time?
  - What is meant by fool proofing?
  - How is a cylindrical pin located externally?
  - What is the alternative of dowels?

2x10

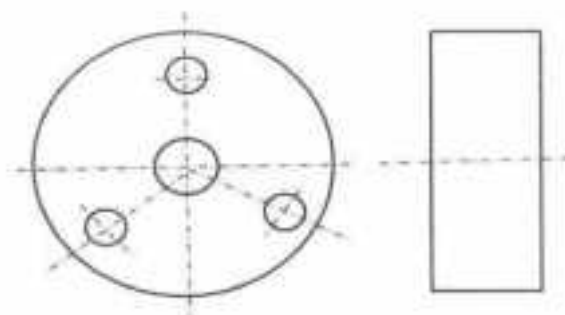
**PART-A**

- Q.2
- What is meant by degrees of freedom? What is 3-2-1 principle? 10
  - Describe internal and external clamps with diagrams. 10
- Q.3
- Name four processes that can be used to make rectangular blocks and describe them briefly. 10
  - Make the process planning for the following part:



10

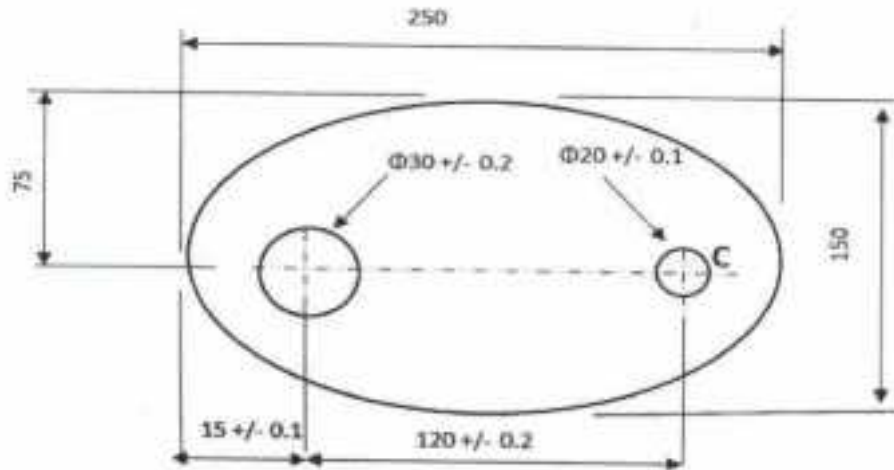
- Q.4 Make the diagram of a Drilling Jig for drilling the holes in the following part:



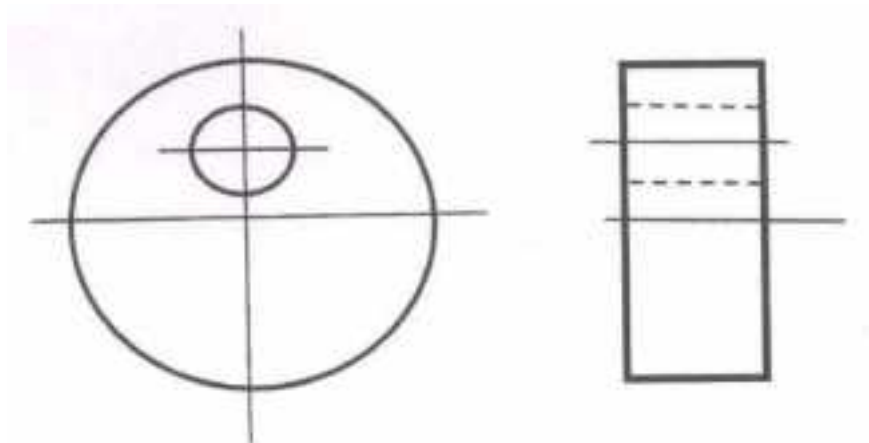
20

**PART-B**

Q.5 Design a locating system for the following part using two round locating pins:



- Q.6 a) What are the various considerations in designing the Milling fixture? What are the steps of making the Milling fixture? 20  
 b) Where are the grinding fixtures used? Give one example. 10
- Q.7 a) What are the steps in designing a welding fixture? 10  
 b) Design the jaws of a three jaw chuck for making the off centre hole in the following part:



10

**End Semester Examination, May 2017**  
**B.Tech. (Industry Integrated) –FifthSemester**  
**VEHICLE ENGINEERING(MII-506)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

- Q.1
- a) Define frameless construction.
  - b) Describe riding height.
  - c) Define 'Caster'.
  - d) What is the function of Panhard rod?
  - e) What is the function of a Tie rod?
  - f) What is Transaxle?
  - g) What are the desired properties of Brake fluids?
  - h) Name various advantages of disc brakes.
  - i) Define anti – lock braking system.
  - j) Define muffler.

2x10

**PART-A**

- Q.2
- a) Discuss full floating axle? 5
  - b) Explain the steering linkages in independent suspension system with neat sketch. 15
- Q.3
- a) Describe Davis's steering system. 5
  - b) Describe various types of Steering Gear box. 15
- Q.4
- a) Discuss the effect of driving thrust & torque on drive line? 5
  - b) Explain the working & construction of a differential. 15

**PART-B**

- Q.5
- a) What are the factors which affect brake performance? 5
  - b) Explain the working & construction of drum brakes. 15
- Q.6
- a) Discuss radial ply tyres& their advantages. 5
  - b) Discuss construction & working of pneumatic suspension system. 15
- Q.7
- a) Describe exhaust system and its components. 5
  - b) Explain exhaust gas re – circulation system with neat sketch. 15

**End Semester Examination, May 2017**  
**B.Tech. (Industry Integrated) – Sixth Semester**  
**PRESS TOOLS - I (M-II-601)**

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1
- What is meant by 'top dead centre'?
  - What is meant by slide adjustment length?
  - How do you calculate the cutting force in blanking?
  - What is meant by gibs in presses?
  - What is meant by 'land in dies'?
  - What is meant by 'spring constant'?
  - What is meant by 'side thrust in punches'?
  - What is the role of wear plates?
  - What is the role of gauges in dies?
  - What is a CNC press brake?

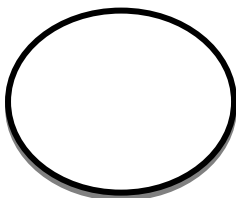
2x10

**PART-A**

- Q.2 Explain the construction and working of a mechanical press in detail.

20

- Q.3 Design a Blanking Die for the following part:



Dia – 40mm  
 Thickness = 2mm  
 Material steel

20

- Q.4
- What is a stripper in dies? What is the force requirement? How is the force provided?
  - Calculate the strip and advance for the following part:

10



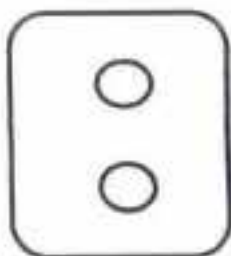
Size – 100 mmx150 mmxThickness = 2.0 mm  
 Material - MS (SPCE)

10

**PART-B**

- Q.5
- What is a progressive tool? Describe advantages of it.
  - Draw a progressive tool for the following part:

5

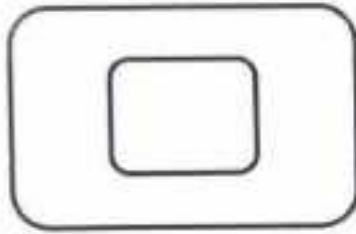


Outside dimensions – 40 mm x 80 mm  
 HoleDia – Dia 7 mm  
 Thickness = 2.0 mm  
 Material – MS (SPCE)

15



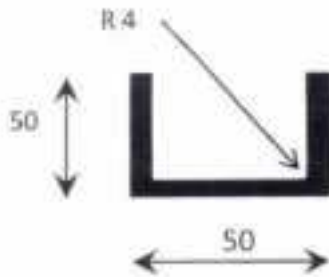
- Q.6 a) What is the compound tool? What are the advantages of compound tools? 8  
 b) Draw a compound tool for the following part:



Outside Dimn = 150 mmx 200mm  
 Inside Dimn = 80 mm x 80 mm  
 Thickness = 2.0 mm  
 Material – MS (SPCE)

12

- Q.7 How can one calculate the blank size for the following part?



Thickness = 1.2 mm  
 Material – SPCE (Steel)

20

**End Semester Examination, May 2017**  
**B. Tech. (ME-Industry Integrated)— Sixth Semester**  
**CAD-II (MII-602)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

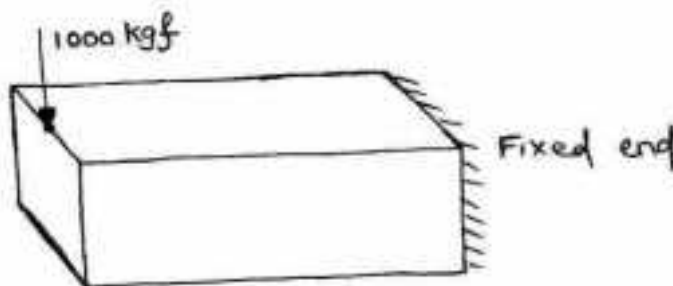
- Q.1
- What is meant by pencil milling?
  - Define CAM.
  - Describe 'sweep' command in surface modeling.
  - Explain  $C^\circ$  continuity.
  - Define implicit model in FEA.
  - What is the difference between an open and closed surface?
  - What is plunge milling?
  - Describe 'healing' command.
  - What is blending function?
  - What is batch production?
- 2 × 10

**PART-A**

- Q.2
- Write and explain blending function for B-spline surface. What are the advantages of B-spline surface over other surface in term of control and continuity? 10
  - Give few examples and explain how surface functions offered by CAD/CAM are used for engineering and design solutions. 10
- Q.3
- Describe the process of making top down assembly. 10
  - Write a note on 'surface of revolution and tabulated surface'. 10
- Q.4
- Explain the concept of FEM briefly and outline the procedure. 10
  - Write short notes on:
    - Coon's patch. 3
    - Offset surface. 3½
    - Bezier surface. 3½

**PART-B**

- Q.5
- Discuss the advantages of FEM over:
    - Classical method.
    - Finite difference method.
 5 × 2
  - A steel beam of square cross-section is fixed at one end and loaded vertically at the other end as shown in figure below:



Describe the process of FEA for analyzing the problem. 10

- Q.6
- Define stiffness matrix and explain its special features. 10

- b) Explain different elements of CNG systems. Also discuss feedback devices in CNG.  
How they are helpful? 10

- Q.7 a) By direct stiffness matrix approach, determine stiffness matrix for:  
i) Bar element.  $5 \times 2$   
ii) Truss element.  
b) Explain with relevant examples, continuous, batch and mass production, along with  
their salient features. 10

# End Semester Examination, May 2017

B. Tech.–Sixth Semester

## WELDING TECHNOLOGY (MII-603)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

- Q.1
- What is formability?
  - What is deep drawing?
  - Name some important material handling equipment.
  - What is the function of flux used in welding process?
  - What are the different types of oxyacetylene flame?
  - What is weld spatter?
  - State the principle of resistance welding.
  - State the limitations of TIG welding.
  - What is HAZ?
  - What is brazing?
- 2x10

### PART-A

- Q.2 Write short note on the following:
- Tube manufacturing.
  - Stretch forming.
  - Deep drawing.
  - Spinning.
- 5x4
- Q.3 Write short note on the following:
- Material handling equipment. 10
  - Plasma arc Cutting. 10
- Q.4
- Explain submerged arc welding with its applications. 10
  - Explain carbon arc welding process with neat sketch. 10

### PART-B

- Q.5
- Explain the thermit welding process with neat sketch. 10
  - Write short note on the following:
    - Spot Welding.
    - Seam Welding.5x2
- Q.6 Discuss various welding defects and their remedies in detail. 20
- Q.7
- Explain Ultrasonic Welding and its application. 10
  - Explain electron beam welding. 10

**End Semester Examination, May 2017**  
**B. Tech. (ME-Industry Integrated)- Sixth Semester**  
**AUTOMATION (MII-604)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) What are the drawbacks associated with the use of automation?
  - b) What is a variable cost?
  - c) Define 'product rate'.
  - d) What is an automated flow line?
  - e) State the drawback of buffer storage.
  - f) What is carousel assembly system?
  - g) What is difference between inspection and testing?
  - h) What is a vision sensor?
  - i) Name various CMM machine used in automation inspection.
  - j) What are the main components of CMM machine?
- 2 × 10

**PART-A**

- Q.2
- a) Explain the USA principle. 5
  - b) What are the various strategies used in automation? 15
- Q.3
- a) Brief about the reasons for using buffer storage. 5
  - b) Explain various transfer mechanism. 15
- Q.4 Describe the various type automated assembly system. 20

**PART-B**

- Q.5
- a) Define sensor and its application in automated inspection. 5
  - b) Discuss contact and non-contact inspection techniques. 15
- Q.6
- a) Discuss about CMM probe and type of probe. 5
  - b) Discuss CMM and its components. What are the advantages and application of CMM? 15
- Q.7
- a) Write short note on "Human workers in automated factory". 5
  - b) Explain automated guided vehicle, its type and components used in it. 15

**End Semester Examination, May 2017**  
**B.Tech. (Industry Integrated) –SixthSemester**  
**VEHICLE BODY ENGINEERING (MII-605)**

Time: 3 hrs.

Max Marks:100

No. of pages:1

Note: *Attempt FIVE questions in all;Q.1 is compulsory. Attempt any TWO questions from Part-A and*

*TWO questions from Part-B. Each question carries equal marks.*

- Q.1    a) What are the various car body types? Brief about any two of them.  
        b) Mention the systems that are included in driver assistance.  
        c) Define 'active safety features in a car'.  
        d) Brief about oil method in flow visualization techniques.  
        e) What are the characteristics of a mini bus?  
        f) What are the characteristics of touring coaches?  
        g) What is an articulated bus?  
        h) Classify bus bodies based on the capacity of the vehicle.  
        i) Classify truck based upon the maximum load carrying capacity of the truck.  
        j) Define 'commercial vehicle having drop side bodies'. 2 × 10

**PART-A**

- Q.2    a) Explain the safety design and aspects in a car. 5  
        b) What are various methods to improve visibility in a vehicle? 15
- Q.3    a) Brief about sublimation in flow visualization techniques. 5  
        b) What are the various forces and moments acting on a vehicle? 15
- Q.4    a) Discuss the various types of metals sections used in bus manufacturing. 5  
        b) Explain the following:  
           i) Classic type.  
           ii) Single decker.  
           iii) Double decker.  
           iv) Split-level bus. 15

**PART-B**

- Q.5    Differentiate between 'conventional'and'integral type frame manufacturing'. 20
- Q.6    a) Write down the design consideration of driver's seat. 5  
        b) Explain construction of commercial vehicle body. 15
- Q.7    a) Explain the following (in case of a tractor):  
           i) Wheelbase.  
           ii) Track.  
           iii) Ground clearance.  
           iv) Cage wheel. 2 × 4  
        b) Write down the classifications of the tractors. 12

**End Semester Examination, May 2017**  
**B. Tech. (ME-Industry Integrated)— Sixth Semester**  
**DIE DESIGN (MII-606)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 2

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANYTWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) What is shot capacity of injection mould?
  - b) What is draft with reference to cavity?
  - c) Define feed system.
  - d) Discuss the mould heating in compression moulding.
  - e) What is press forging?
  - f) State the formula for calculating forging force.
  - g) What are the various steps for the design of forging dies?
  - h) What are the safety precautions to be taken while operating dies?
  - i) What is coining dies?
  - j) What is die casting?

2 × 10

**PART-A**

- Q.2
- a) What is injection mould? Name its parts.
  - b) Explain thermoplastic and thermo-setting plastics.
  - c) Explain the following with a neat sketch:
    - i) Pin ejection.
    - ii) Blade ejection.
    - iii) Sleeve ejection.
  - d) Describe basic cooling principles and their importance to product quality.
- Q.3
- a) Explain various steps for the design of forging dies.
  - b) Describe the following for a forging die with the help of sketch:
    - i) Flash.
    - ii) Parting line.
    - iii) Draft.
    - iv) Trimming.
  - c) Explain the following:
    - i) Allowances and tolerances.
    - ii) Forging defects.
  - d) Explain forging hammers with neat sketch.
- Q.4
- a) Explain with neat sketch open die and closed die forging.
  - b) Explain calculating of raw stock in forging.

5 × 4

5 × 4

10

10

**PART-B**

- Q.5
- a) Describe hot chamber die casting process with neat sketch.
  - b) How die casting machine are specified?
  - c) Write short notes on:
    - i) Selection of materials and heat treatment in die casting.
    - ii) Design approach for die elements.
  - d) Explain gravity die casting.
- Q.6
- Write short notes on:
    - a) Swaging tool.

5 × 4

- b) Coining dies and its applications.
- c) Horizontal forging.
- d) Materials for coining dies.

5 × 4

Q.7 Explain the following with neat sketches:

- a) Application of press forging.
- b) Roll forming.
- c) Upsetting dies.
- d) Calculation of upsetting die.

5 × 4



**End Semester Examination, May 2017**  
**B.Tech. (Industry Integrated)—Seventh Semester**  
**ROBOTICS (MII-701)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q. 1 is compulsory. Attempt ANY TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) Define 'laws of robotics'.
  - b) Sketch a robot and name its parts.
  - c) What is a mechanical gripper?
  - d) Give some examples of tool as robot end effector.
  - e) Briefly explain the function of a piezoelectric sensor.
  - f) What is image analysis?
  - g) What are safety sensors?
  - h) Define 'pneumatic sensors'.
  - i) Define 'path and trajectory'.
  - j) Define 'joint space trajectory planning'.
- 2 × 10

**PART-A**

- Q.2
- a) Explain the three degrees of freedom associated with the robot wrist with a neat sketch. 5
  - b) Sketch and explain various configuration of robot in detail. 15
- Q.3
- a) What do you understand about the sensor and vision related to robotics? 5
  - b) Discuss applications of robots in material handling. 15
- Q.4
- a) What are the principles for robot application planning? 5
  - b) Explain industrial applications of robots. 15

**PART-B**

- Q.5
- a) Describe 'force sensors' in brief. 5
  - b) Explain various functions of sensors in robots in detail. 15
- Q.6
- a) Discuss process of imaging in brief. 5
  - b) Explain architecture of a robotic vision system along with stationary and moving camera in detail. 15
- Q.7
- a) Define 'open' and 'closed loop control'. 5
  - b) Explain various steps in trajectory planning in detail. 15

**End Semester Examination, May 2017**  
**B.Tech. (Mechanical Engg. Industry Integrated)—Seventh Semester**  
**PRESS TOOLS-II (MII-702)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q. 1 is compulsory. Attempt ANY TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) What is meant by percent reduction in draw operation?
  - b) What is the recommended clearance between punch and die in draw dies?
  - c) What is meant by draw beads in draw dies?
  - d) What is the function of cushion pins in draw operation?
  - e) What is the function of heels in dies?
  - f) What is the material of draw dies?
  - g) How can one reduce wear and tear in re-striking die material?
  - h) How does die radius affect draw operation results?
  - i) What is the effect of material hardness on drawability?
  - j) How does grain direction affect bending?
- 2 × 10

**PART-A**

- Q.2
- a) What is the difference between draw, re-striking and bending operations? 10
  - b) Draw the diagrams of a V-bending and U-bending operation. 10
- Q.3
- a) Describe the construction of a draw operation with the help of a diagram. 10
  - b) Describe the distribution of stresses in various zones of deep draw part. 10
- Q.4
- a) What are the causes of cracks and thinning in draw operation? 10
  - b) Describe the ways of controlling cracks and wrinkles in detail. 10

**PART-B**

- Q.5
- a) What is the role of re-striking operation? How is it different from trimming, and piercing operation? 10
  - b) Draw the diagram of downward re-striking die in open and closed condition. 10
- Q.6
- a) Describe the construction of upward re-striking die with the help of a diagram. 10
  - b) How is the holding force in re-striking die calculated? How is it different than blanking die? 10
- Q.7
- a) Describe the advantages of simulation in stamping process in detail. 10
  - b) What are the different steps of stamping simulation? 10

**End Semester Examination, May 2017**  
**B.Tech. (Mechanical Engg. Industry Integrated)—Seventh Semester**  
**SURFACE ENGINEERING(MII-703)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt ANY TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) Define 'galvanizing'.
  - b) What do you understand by vitreous enameling?
  - c) Define 'hexagonal close packed crystal structure'.
  - d) Define 'carbonitriding'.
  - e) Define 'electroless plating process'.
  - f) Define 'plasma'.
  - g) Define 'high velocity oxy-fuel process'.
  - h) Define 'thin coatings'.
  - i) Define 'alkaline cleaning'.
  - j) Name some chemical cleaning processes.
- 2 × 10

**PART-A**

- Q.2
- a) Discuss surface texture properties of a material machined on shaper in brief. 5
  - b) Explain induction hardening process in detail. 15
- Q.3
- a) Discuss carburizing process in brief. 5
  - b) Explain case hardening methods and applications in detail. 15
- Q.4
- a) What are explosion cladding coatings? 5
  - b) Explain electroless plating process, its characteristics, properties and applications in detail. 15

**PART-B**

- Q.5
- a) Describe plasma spray coating in brief. 5
  - b) Explain various types of conversion coating selection criteria for coatings. 15
- Q.6
- a) Discuss chemical vapor deposition. 5
  - b) Explain with a neat sketch, electron beam hardening technique and its advantages. 15
- Q.7
- a) Write a short note on 'Ion implantation process'. 5
  - b) What are the methods for tool coatings? Explain diamond coating and its advantages. 15

**End Semester Examination, May 2017**  
**B.Tech. (Industry Integrated)—Seventh Semester**  
**QUALITY ENGINEERING (MII-704)**

Time: 3 hrs.

Max Marks: 100

No. of pages: 1

Note: *Attempt FIVE questions in all; Q. 1 is compulsory. Attempt ANY TWO questions from PART-A and TWO questions from PART-B. Each question carries equal marks.*

- Q.1
- a) Define 'fish bone diagram'.
  - b) Write down the dimensions of quality.
  - c) Define 'probability'.
  - d) Write down various symbols used in flow charts and their significance.
  - e) Define 'histogram'.
  - f) Define 'MTBF'.
  - g) Define 'acceptance sampling'.
  - h) Define 'TQM'.
  - i) Draw Maslow's Hierarchy of needs.
  - j) Write down 6 C's of total quality management. 2 × 10

**PART-A**

- Q.2
- a) Explain PDCA Cycle. 5
  - b) What do you understand by quality and what are dimensions of quality? 15
- Q.3 Explain the applications of probability concepts in quality control. 20
- Q.4
- a) What is significance of a scatter diagram? 5
  - b) Discuss various statistical tools in quality control. 15

**PART-B**

- Q.5
- a) Define 'acceptance sampling'. 5
  - b) Discuss failure mode and effect analysis in detail, along with its procedure and benefits with examples. 15
- Q.6
- a) How can one differentiate between total quality management and total quality control? 10
  - b) How employee involvement can contribute towards TQM. 10
- Q.7
- a) Write a short note on 'OHSAS'. 5
  - b) Explain basic steps for successful implementation of total quality management system in an organization. 15

**End Semester Examination, May 2017**  
**M. Sc. (Energy and Environment) – Second Semester**  
**ENVIRONMENTAL POLLUTION AND TOXICOLOGY (MSE-201)**

Time: 3 hrs.

Max Marks: 60

No. of pages: 1

Note: *Attempt FIVE questions in all; taking at least ONE question from each unit. Q.1 is compulsory. Each question carries equal marks.*

Q.1 Answer briefly:

- a) Write a brief note on Environmental Pesticide Control Act.
- b) Differentiate between 'a risk' and 'a hazard'.
- c) What are sentinels?
- d) What is a 'sensitive sub-population'?

3 × 4

**UNIT-I**

Q.2 Why is the toxicity of a new drug difficult to predict? Explain the effect of combining drugs/chemical agents on the environment in detail. 12

- Q3. a) What are the leading causes of pharmaceutical death?  
 b) Explain the parameters of xenobiotic interaction with the ecosystem with the help of a flow chart. 6 × 2

**UNIT-II**

- Q.4 a) What is the importance of volume of absorption in toxicology?  
 b) Explain the factors determining the rate of absorption of chemicals in the body in detail. 6 × 2

- Q.5 a) What are the different types of toxicants in the environment?  
 b) What is sulfanilamide selectively toxic? 6 × 2

**UNIT-III**

Q.6 What do you mean by toxic kinetics? Explain the principles and mechanism of toxic kinetics in detail. 12

- Q.7 a) "Promotion is reversible in carcinogenesis." Comment and explain. 8  
 b) Write a short note on 'bio monitoring' with suitable examples. 4

**End Semester Examination, May 2017**  
**M. Sc. (Energy & Environment) – Second Semester**  
**RENEWABLE ENERGY AND SYSTEMS(MSE-202)**

Time: 3 hrs

Max Marks:60

No. of pages:1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt FOUR more questions out of SIX, taking at least ONE question from each UNIT. Each question carries equal marks.*

Q.1 Answer briefly:

- a) How does solar energy is helpful in energy generation?
- b) What are the advantages of wind turbines?
- c) What do you mean by geothermal heating system?
- d) What are the advantages of tidal energy?
- e) What is nuclear energy?
- f) What are the advantages of hydrogen energy?

2x6

**UNIT-I**

- |     |  |   |
|-----|--|---|
| Q.2 | a) How does photovoltaic cell work?                            | 4 |
|     | b) Discuss solar thermal technology systems.                   | 8 |
| Q.3 | a) Illustrate design and performance of wind energy in detail. | 8 |
|     | b) How wind speed is calculated?                               | 4 |

**UNIT-II**

- |     |   |   |
|-----|---|---|
| Q.4 | a) Explain geothermal reservoirs and resources in detail.   | 6 |
|     | b) Give an account of working of geothermal power plant.  | 6 |
| Q.5 | a) What is tidal energy?  | 4 |
|     | b) Define the different types of tidal energy. Explain the conversion of tidal energy into electrical energy. | 8 |

**UNIT-III**

- |     |  |   |
|-----|--|---|
| Q.6 | a) What is hydroelectric power?  | 4 |
|     | b) Define the classification of hydro power plants.                      | 2 |
|     | c) Explain the working of hydroelectric power plant in detail.           | 6 |
| Q.7 | Write short notes on:  |   |
|     | a) Hydrogen energy and storage methods of hydrogen.                      | 6 |
|     | b) Nuclear reactions and risk and safety in nuclear energy technologies. | 6 |

**End Semester Examination, May 2017**  
**M. Sc.(Energy & Environment) – SecondSemester**  
**WASTE TREATMENT TECHNOLOGIES (MSE-203)**

Time: 3 hrs.

Max Marks:60

No. of pages:1

Note: *Attempt FIVE questions in all. Attempt FOUR questions from remaining SIX, selecting at least ONE from each UNIT.Q.1 is compulsory. All questions carry equal marks.*

Q.1 Answer briefly:

- a) What is the process of decomposition of sewage? Why aerobic decomposition is preferred to the anaerobic decomposition in sewage treatment?
- b) What is the general composition of urban solid waste and basic aspect of solid waste management?
- c) What are Hazardous wastes and the market for their management? 4 × 3

**UNIT-I**

- Q.2
  - a) What is meant by coagulation? What are the common coagulants used? Describe the chemical reaction involved and the flocs that form. 6
  - b) What do you understand by filtration? Name and describe the various mechanisms that take place during filtration. 6
- Q.3
  - a) What do you mean by "Sludge Digestion"? Name and explain the various stages during the process of anaerobic sludge digestion. Also, enumerate the factors on which sludge digestion depends. 6
  - b) Write short notes on:
    - i) Oxidation Pond and ditch.
    - ii) Septic tank.
    - iii) Imhoff tank. 2 × 3

**UNIT-II**

- Q.4
  - a) What are the biological processes in sanitary landfills? What factors affect leachate composition? 6
  - b) What are leachate control strategies? How is management of sanitary landfills achieved and monitored? 6
- Q.5 How is organic waste degraded with the help of earthworms? How are the worms selected and worm cast production obtained and harvested? 12

**UNIT-III**

- Q.6
  - a) What are xenobiotic compounds? How are these compounds biologically degraded? 6
  - b) What are the methods preferred for biological treatment of toxic organic substances? 6
- Q.7
  - a) What are the various biotechnological applications for Hazardous waste management? 4
  - b) What are the biotechnological tools to degrade?
    - i) Cyanide.
    - ii) Oxalate, Urea etc.
    - iii) Petrochemicals in effluents.
    - iv) Phenols as pollutants. 2 × 4

**End Semester Examination, May 2017**  
**M. Sc. (Energy & Environment) – Second Semester**  
**ENVIRONMENTAL ECONOMICS(MSE-204)**

Time: 3 hrs

Max Marks:60

No. of pages:1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt FOUR more questions out of SIX, taking at least ONE question from each UNIT. Each question carries equal marks.*

Q.1 Answer the following:

- a) How important is valuation of an environmental good to mankind? Explain.
- b) How does environment degradation affect economic efficiency? Explain with examples.
- c) What does cost and benefit in cost benefit analysis refer to?
- d) How can India learn from other nations to develop policies for sustainable development? Explain by citing suitable examples. 3x4

**UNIT-I**

- Q.2 a) What are the policies which guide efficient use of common property resources? Explain in detail. 8
- b) Explain how chemical toxicity affects soil. 4

- Q.3 What do you understand by externalities? Does it affect the environmental economics? Explain with examples. 12

**UNIT-II**

- Q.4 a) How is pricing done in economy? Explain pricing of environmental goods. 8
- b) How does environmental impact assessment affect economy? 4
- Q.5 Explain in detail the different environmental issues that affect the economics of a nation. 12

**UNIT-III**

- Q.6 a) Differentiate between 'carbon rating' and 'carbon trading'. 4
- b) How does economics shortsightedness affect the growth of human well-being? 6
- c) How can sustainable development be achieved by involving local people? 2
- Q.7 How has mankind affected the climate change? What are its effects on economic growth? 12



**End Semester Examination, May 2017**  
**M. Sc.(Energy & Environment) – SecondSemester**  
**FUNDAMENTALS OF MOLECULAR BIOLOGY FOR ENVIRONMENT**  
**(MSE-205A)**

Time: 3 hrs.

Max Marks:60

No. of pages:1

Note: *Attempt FIVE questions in all; Q.1 is compulsory. Attempt FOUR more questions out of SIX, taking at least ONE question from each UNIT. Each question carries equal marks.*

- Q.1 Briefly explain the following:
- Why is an RNA primer necessary for DNA replication?
  - Why disarming of pTi is done?
  - Differentiate between template strand or the antisense strand and coding strand or the sense strand.
  - What is spi phenotype?
  - What is the difference between dNTP and ddNTP?
  - What is the significance of cDNA cloning?
- 2 × 6

**UNIT-I**

- Q.2 How prokaryotic and eukaryotic DNA organize themselves to fit within the nucleus? 12
- Q.3 How lactose is utilized as a carbon source in a bacterial cell? What happens if glucose is added into the medium? 12

**UNIT-II**

- Q.4 How nutritional factors govern the development of lytic or lysogenic life cycle in lambda phage?Also, explain the molecular basis of the same. 12
- Q.5
- Briefly explain how lacZ gene can be used as markers for the screening of a particular plasmid. 4
  - How agrobacterium mediated gene transfer takes place in plants? 8

**UNIT-III**

- Q.6 What is metagenomics? Describe the different approaches to metagenomic analysis. 12
- Q.7 Discuss the different promoter systems used for expression of a foreign gene in eukaryotes? 12

# End Semester Examination, May 2017

## B. Tech.–FirstSemester APPLIED PHYSICS-I (PH-101A)

Time: 3 hrs.

Max Marks:100

No. of pages: 1

Note: *Attempt FIVE questions in all.Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.*

Q.1 Attempt all questions:

- What is population inversion?
- Find numerical aperture for an optical fibre having core of refractive index 1.54 and cladding of refractive index 1.45.
- What are fermions? Explain with examples.
- What is phase velocity?
- State postulates of special theory of relativity.
- Write Lorentz transformation equations for position and time.
- What is curl of an electric field?
- Is potential gradient a vector or scalar quantity?
- What are polar dielectrics? Explain with examples.
- What is stopping power of material? 2 × 10

### PART-A

- Discuss the principle, construction and working of He-Ne Laser with suitable diagrams. 10
  - What is numerical aperture of an optical fiber? Derive an expression for numerical aperture. 6
  - Write short note on (*any one*):
    - Multimode step index optical fibre.
    - Multimode graded index optical fibre. 4
- Derive Schrodinger's time dependent equation for matter waves. 8
  - Determine the normalized wave function for a particle confined to a 1-dimensional box of length L. Also find energy eigenvalues for the particles. 12
- Derive expressions for time-dilation and length contraction using Lorentz transformation equations. 8
  - Establish mass energy equivalence relation  $E = mc^2$ . 8
  - What would be the mass of an electron, if it moves with velocity  $2 \times 10^8 \text{ m/s}$ ? 4

### PART-B

- What are Poisson's and Laplace equations? Solve the Laplace equation in 1-dimension for a parallel plate capacitor. 8
  - Derive an expression for energy stored due to a continuous charge distribution over entire space. 8
  - Given a potential of the form  $V = \frac{A}{r} + B$ , where A and B are constants and  $r$  is position vector. Check if the potential satisfies Laplace equation. 4
- Establish the relation between three electric vectors  $E$ ,  $P$  and  $D$ . 7
  - Write a short note on the behaviour of a dielectric in an alternating field. 6
  - Derive Clausius-Mossotti relation for dielectrics. 7
- Discuss different mechanisms which are responsible for the interaction of  $\gamma$ -rays with matter. 8

- b) Describe the principle, construction and working of G.M counter. Discuss external and internal quenching processes.

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