

AR18

CODE: 18BST204

SET-2

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)**

II B.Tech II Semester Supplementary Examinations, January-2022

**COMPLEX VARIABLES AND STATISTICAL METHODS
(Civil Engineering)**

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Determine the analytic function whose real part is $\frac{\sin 2x}{(\cosh 2y - \cos 2x)}$. 6M

- b) The potential function is $\log \sqrt{(x^2 + y^2)}$, find the flux function and complex potential function. 6M

(OR)

2. a) Obtain the regular function whose imaginary part is $(x - y)/(x^2 + y^2)$ 6M

- b) Find the orthogonal trajectories of the family of curves $x^4 + y^4 - 6x^2y^2 = \text{constant}$ 6M

UNIT-II

3. a) Evaluate $\oint_C \frac{e^{2z}}{(z+1)^4} dz$, where C is the circle $|z| = 3$. 6M

- b) Obtain the value of $f(3)$ where $f(a) = \oint_C \frac{z^2 - z - 2}{z - a} dz$ and C is the circle $|z| = 2.5$ 6M

(OR)

4. Evaluate $\int_C (z^2 + 3z + 2) dz$ where C is the arc of the cycloid $x = a(\theta + \sin \theta)$, $y = a(1 - \cos \theta)$ between the points $(0,0)$ and $(\pi a, 2a)$. 12M

UNIT-III

5. a) In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation distribution. 6M

- b) The mean and variance of a binomial distribution are 4 and 2 respectively. Find the probability of (i) at least 6 successes (ii) at most 5 successes. 6M

(OR)

6. a) A factory has three machines A, B and C producing 1,500, 2,500 and 3,000 bulbs per day, respectively. Machine A produces 1.5% defective bulbs, machine B produces 2% defective bulbs and machine C produces 2.5% defective bulbs. At the end of the day, a bulb is drawn at random and is found to be defective. Obtain the probability that this defective bulb has been produced by machine B? 6M
- b) A shipment of 8 similar microcomputers to a retail outlet contains 3 that are defective. A school makes a random purchase of 3 of these computers. Find the probability distribution of X, the number of defective microcomputers. Also determine mean and variance of X. . 6M

UNIT-IV

7. A die tossed 960 times and it falls with 5 upwards 184 times. Is the die unbiased at a level of significance of 0.01? 12M
- (OR)**
8. The means of two large samples of sizes 300 and 400 members are 55.3 inches and 57 inches respectively. Can the samples be regarded as drawn from the same population of S.D 1.8 inches? 12M

UNIT-V

9. A simply supported beam carries a concentrated load P (lb) at its mid-point. Corresponding to various values of P, the maximum deflection Y (in) is measured. They are given below: 12M

P	100	120	140	160	180	200
Y	0.45	0.55	0.60	0.70	0.80	0.85

Obtain the correlation coefficient.

(OR)

- 10 In the accompanying table, x is the tensile force applied to a steel specimen in thousands of pounds, and y is the resulting elongation in thousandths of an inch: 12M

x	1	2	3	4	5	6
y	57	64	80	46	62	72

Obtain the second degree polynomial of the least squares method and use it to predict the elongation when the tensile force is 3.5 thousand pounds.

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Write the equations of equilibrium. 2M
b) Determine the x and y components of each of the forces as shown in Figure.1 10M

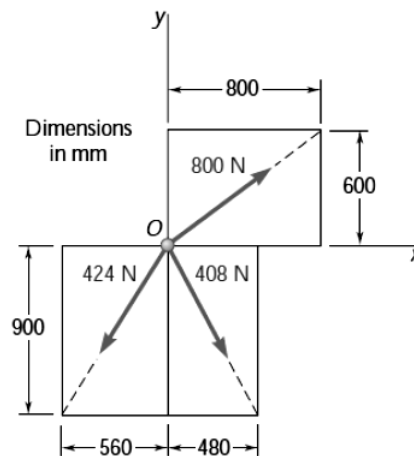


Figure-1

(OR)

2. a) Explain different types of force systems 4M
b) Two forces are applied at point B of beam AB as shown in the figure-1. Determine the magnitude and direction of their resultant using (a) the parallelogram law, (b) the triangle rule 8M

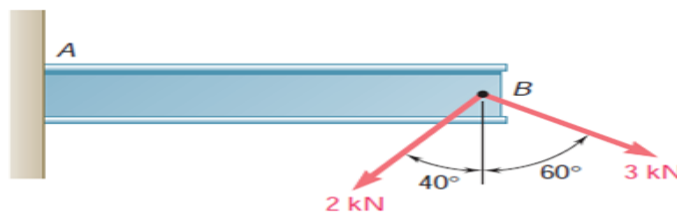


Figure-1

UNIT-II

3. a) Define equilibrium of a body and give conditions of equilibrium when subjected to forces 4M
b) A cylinder weighing 400 N is held against a smooth incline by means of the weightless rod AB in Figure 2. Determine the forces P and N exerted on the cylinder by the rod and the incline plane. 8M

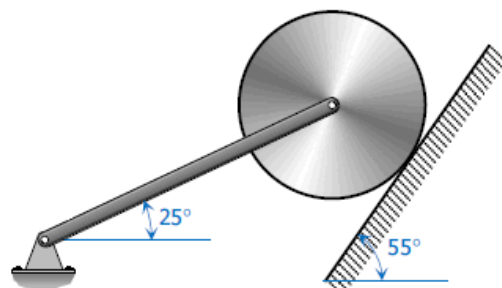


Figure-2

(OR)

4. a) State and prove varignons theorem 4M
 b) Determine the reactions at the points of supports A, B and C for two identical rollers of each weight 100 N are supported by a vertical wall and an inclined plane as shown in Figure 3. 8M

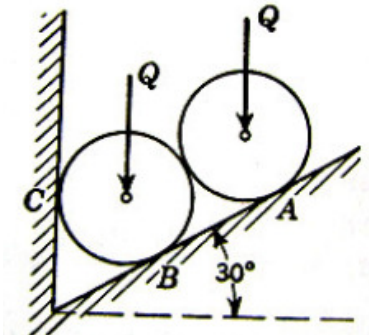


Figure-3

UNIT-III

5. a) Explain the concept of cone of friction 4M
 b) A man of weighing 75N stands on the middle rung of a 25N ladder resting on a smooth floor and against a wall as shown in figure 4. The ladder is prevented from slipping by a string OD. Find the tension in the string and reactions at A and B. 8M

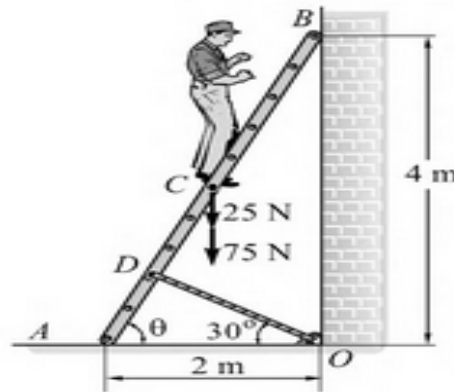


Figure-4

2 of 4

(OR)

6. a) List out the major applications of the trusses 4M
 b) Calculate the axial force S in each bar of the simple truss supported and loaded as shown in the figure-5. The triangle ACB is isosceles with 30° angles at A and B and $P = 15 \text{ KN}$. 8M

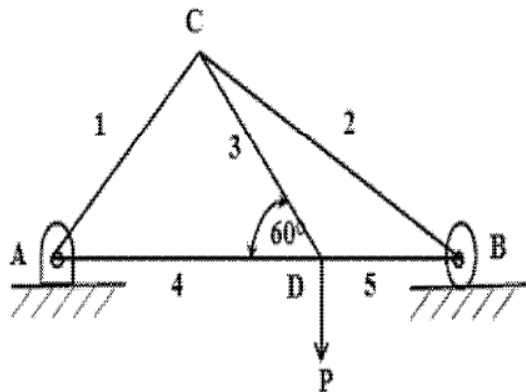


Figure-5

UNIT-IV

7.	a)	Define centroid and centre of gravity	4M
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	b)	Referring to the Figure, determine the coordinates x_c and y_c of the center of a 100mm diameter, circular hole cut in a thin plate so that this point will be the centroid of the remaining shaded area as shown in the figure-6.	8M
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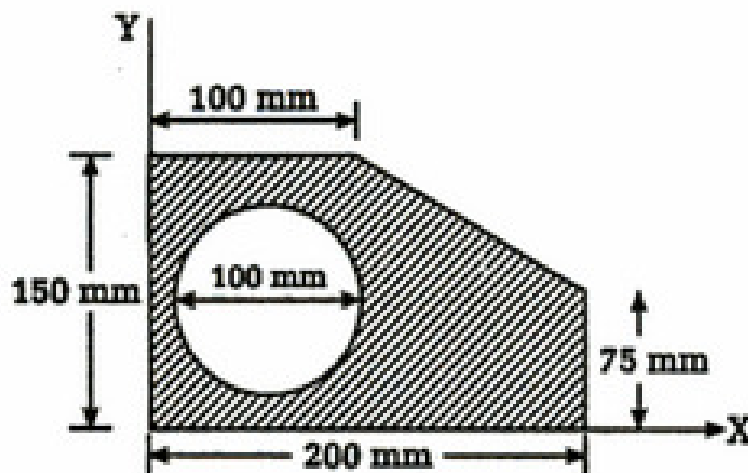


Figure-6

(OR)			
8.	a)	Define Moment of Inertia	2M
	b)	Compute the moment of inertia of the composite area about the x- axis as shown in the figure 7.	10M

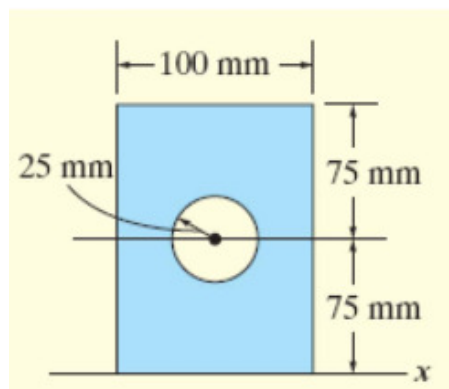
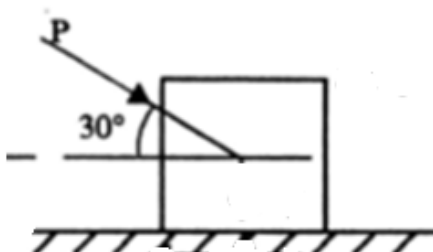


Figure-7

UNIT-V

9. a) Explain the concept of D'Alemberts principle? 4M
- b) A block of mass 60 kg is placed on a rough horizontal floor as shown in figure. A force P inclined at an angle of 30° is applied on the block. If the block reaches a velocity of 15 m/s in covering a distance of 20 m, what is the magnitude of the force P. Take coefficient of kinetic friction between block and floor equal to 0.36. 8M



(OR)

10. a) A body starting from rest moves in a straight line with its equation of motion being $S=5t^3-4t^2+3t+2$ where, S is displacement in m and t is time in s. What is its acceleration after two seconds? 4M
- b) A ship being launched slips down the skids with uniform acceleration. If 12s is required to traverse the first 5.6m, what time will be required to slide the total distance of 150m? With what velocity v will the ship strike the water? 8M

AR18

CODE: 18MET204

SET-2

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)**

II B.Tech II Semester Supplementary Examinations, January-2022

**STRENGTH OF MATERIALS
(Mechanical Engineering)**

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

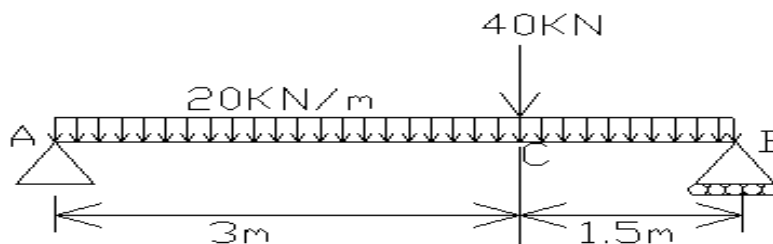
All parts of the Question must be answered at one place

UNIT-I

1. a) Define Hooke's Law and Poisson's ratio. 4M
b) Draw stress vs strain diagram for mild steel and mark salient points on the curve. 8M
(OR)
2. a) Derive the expression between three elastic constants (E, G & K). 6M
b) A steel rod of 20mm diameter passes centrally through a copper tube of 50mm external diameter and 40mm internal diameter. The tube is closed at each end by rigid plates of negligible thickness. The nuts are tightened lightly home on the projecting parts of the rod. If the temperature of the assembly is raised by 50°C, Calculate the stress developed in copper and steel. Take E for steel and copper as 200 GN/m² and 100 GN/m² and α for steel and copper as 12×10^{-6} per °C and 18×10^{-6} per °C. 6M

UNIT-II

3. a) A thin cylindrical vessel 3 m long is of 1 m diameter with 20 mm thick plates is subjected to an internal pressure of 20 MPa. Calculate the changes in length and diameter of the vessel. Take E = 200 GPa and Poisson's ratio = 0.28 for the vessel material. 6M
b) Draw the shear force and bending moment diagrams for the simply supported beam loaded as shown in the Figure. 6M

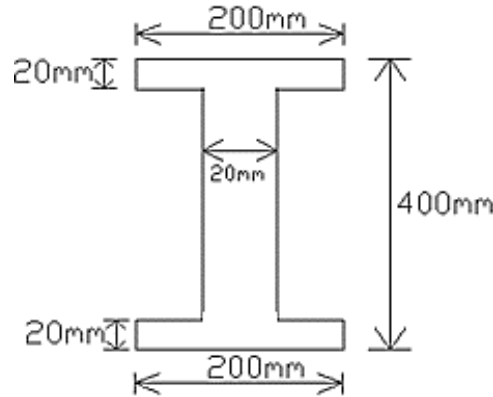


(OR)

4. a) A cylindrical vessel 2 m long and 500 mm in diameter with 10 mm thick plates is subjected to an internal pressure of 3 MPa. Calculate the change in volume of the vessel. 6M
Take
E = 200 GPa and Poisson's ratio = 0.3 for the vessel material.
- b) A Cantilever beam 2m long carries point loads 4 kN, 5 kN and 3 kN at a distance of 1m, 1.5m and 2m respectively from the fixed end. Draw the shear force and bending moment diagrams for this beam. 6M

UNIT-III

5. Determine the maximum shear stress in a cantilever beam of equal legs I-cross section as shown in the Figure if the beam is subjected a shear force of 100kN. Also draw the shear stress distribution across the cross section. 12M



(OR)

6. Find the maximum shear stress for equal leg I-cross section. Both the flange's width is 200mm and thickness of 20mm. The width of the web is 10mm and overall depth is 500mm. Shear force is 200kN. 12M

UNIT-IV

7. a) A shaft is transmitting 97.5 kW at 180 r.p.m. If the allowable shear stress in the material is 60 MPa, find the suitable diameter for the shaft. The shaft is not to twist more than 1° in a length of 3 metres. Take $C = 80$ GPa. 6M
- b) A steel column of hollow Circular section, 65 mm external diameter, 50 mm internal diameter is 2.5m long and hinged at the both the ends. The load is parallel to the axis but eccentric. Find the maximum eccentricity for a crippling load equal to 75% of Euler's load. The yield stress is 310 MPa. $E = 2.06 \times 10^6$ MPa 6M

(OR)

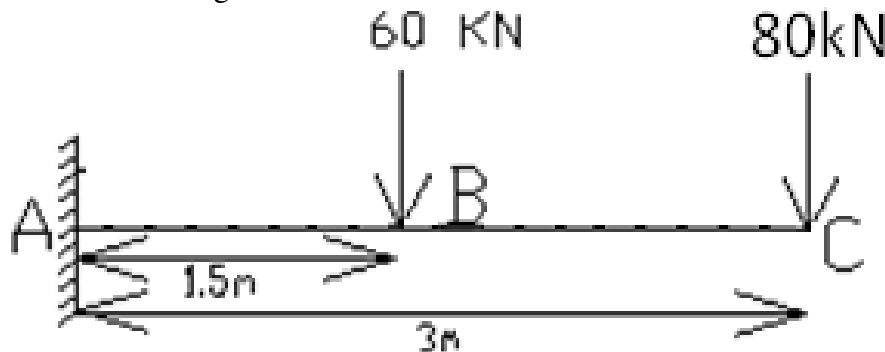
8. a) Derive torsion equation and list the assumptions. 6M
- b) A solid round bar of 60mm diameter and 2.5m long is used as a column. One end of the column is fixed, while the other is free. Find the safe load using Euler's formula. Assume $E = 200$ GPa and Factor of safety = 3. 6M

UNIT-V

9. A simply supported beam AB of span 4 metres is carrying a uniformly distributed load of 2kN/m over the entire span. Find the maximum slope and deflection of the beam. Take $EI = 80 \times 10^9$ N-mm². 12M

(OR)

10. a) Determine the deflection and slope at the points B and C for a cantilever beam loaded as shown the figure. Take $E = 185$ GPa and $I = 150 \times 10^6$ mm⁴. 6M



- b) Determine the maximum deflection and slope at the free end of a cantilever beam subjected to uniformly distributed load. 6M

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Does a Communication system need a modulation mechanism? Support your answer with necessary explanation? 6M
- b) Draw the circuit diagram of Square law diode modulator and explain AM generation from this circuit with necessary equations. 6M
- (OR)
2. a) Prove that in AM, transmitting power is dependent on modulation index. 6M
- b) Compare Square law diode detection and Envelope detection. 6M

UNIT-II

3. a) Explain the generation of DSB-SC using balance modulator with necessary equations. 6M
- b) Explain how a synchronous carrier can be generated using Costas loop. 6M
- (OR)
4. a) Draw the spectrum representation for DSB, DSB-SC and SSB-SC signals assuming a multi tone message signal. 8M
- b) Discuss various applications of Vestigial sideband modulation. 4M

UNIT-III

5. a) Explain the Armstrong method of FM generation with neat diagrams. 6M
- b) A carrier is frequency modulated by a sinusoidal modulating signal of frequency 2 kHz, resulting in a frequency deviation of 5 kHz. What is the bandwidth occupied by the modulated waveform? The amplitude of the modulating sinusoid is increased by a factor 2 and its frequency lowered by 500Hz. What is the new bandwidth? 6M
- (OR)
6. a) Explain the balanced frequency discriminator of FM detection. 6M
- b) Explain TDM and FDM with necessary sketches. 6M

UNIT-IV

7. a) Briefly explain the effect of feedback on performance of AM transmitter. 6M
- b) Draw the block diagram of a tuned radio frequency receiver and elaborate its limitations 6M
- (OR)
8. a) Draw and Explain about of High level AM transmitter. 6M
- b) Draw and Explain about Superhetrodyne receiver. 6M

UNIT-V

9. a) Draw the PAM wave forms for single polarity and double polarity cases. Explain the generation of PAM signal using a transistor. 6M
- b) Explain about threshold effect in FM systems 6M
- (OR)
10. a) Explain about Demodulation of Pulse Position Modulation signals with neat sketches. 6M
- b) Derive the expression for Figure of merit of DSB-SC receiver. 6M

AR18

CODE: 18CST205

SET-2

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)**

II B.Tech II Semester Supplementary Examinations, January-2022

**COMPUTER ORGANIZATION & ARCHITECTURE
(Common to CSE & IT)**

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Using two address instruction format to write an assembly language program to execute the following function 4 M
 $Z = (A+B/C+D) / 6.$
b) Basic operational concept between CPU and memory for execute an instruction. 8 M
- (OR)
2. Describe the register organization of CPU and illustrate how the data is obtained and stored in a register. 12 M

UNIT-II

3. a) An integer $(-18)_{10}$ is to be stored in register in signed 2's complement fixed point representation. Determine the value in the register. 4 M
b) Illustrate the operation of 4-bit ripple carry adder with an example. 8 M
- (OR)
4. Explain the Booth algorithm and represent how the booth's multiplication is performed for the operands A= 10001 and B= 11001. 12 M

UNIT-III

5. a) Explain the concept of memory interleaving with neat sketch. 8 M
b) Explain the memory operation for the following cases. 4 M
1) BRP X 2) BRN X 3) BRZ X 4) BRO X
- (OR)
6. Explain the different cache mapping techniques used in CPU design. 12 M

UNIT-IV

7. Illustrate how I/O & memory are connected to CPU with appropriate block diagram, also explain the types of I/O systems. 12 M
- (OR)
8. a) Explain memory mapped I/O system with relevant flow chart. 8 M
b) What happens in the daisy-chain priority interrupt when device-1 requests a interrupt after device-2 has sent an interrupt request to the CPU, but before the CPU responds with the interrupt acknowledge? Explain with relevant diagrams. 4 M

UNIT-V

9. What is a delayed branch? Explain delayed branching with the three segment pipeline. 12 M
- (OR)
10. Interpret the effect of hazard in the performance of the processor and explain the different types of hazard. 12 M

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) State Gauss's law and derive the expression for electric flux density D for infinite line charge ρ_L using Gauss's law. 8M
- b) Three point charges $+Q$ C are located at the corners of an equilateral triangle; determine point charge to be kept at the center of the triangle so that resultant force acting on any charge which is located at corners of the triangle is zero. 6M

(OR)

2. a) State Gauss's law and derive the expression for electric flux density D for infinite sheet charge ρ_s using Gauss's law 8M
- b) Find the electric charge density ρ_v at $(1, \frac{\pi}{4}, 3)$ for $D = z\rho\cos^2\theta \mathbf{a}_z$ C/m² and total charge enclosed by cylinder of radius 1m with $-2 \leq z \leq 2$. 6M

UNIT-II

3. Derive Laplace's and Poisson's equation for static electric field. 14M

(OR)

4. a) Derive the expression for capacitance of parallel plate capacitor. 8M
- b) Find the polarization, P in a homogenous and isotropic dielectric material. 6M
Whose $\epsilon_r=3.0$ when $D=3.0a_r \mu C/m^2$

UNIT-III

5. a) Derive the expression for Magnetic field Intensity H at the center of a square loop of side L meters, carrying a current I amps using Bio-Savart's law 10M
- b) Determine the magnetic field intensity, H at the center of a square current element. The length of each side is 2 m and the current, $I=1.0$ Amp 4M

(OR)

6. a) Find the magnetic field intensity H for infinite length of current carrying conductor using amperes law 8M
- b) A circular loop located on $x^2 + y^2 = 16, z = 0$ carries a direct current of 10A along \mathbf{a}_ϕ . Determine H at $(0,0,6)$ and $(0,0,-6)$ 6M

UNIT-IV

7. Derive the expression for torque on a current loop placed in a magnetic field 14M

(OR)

8. a) a) Derive the force equation, force on a long current carrying conductor in Magnetic field. 8M
- b) b) In a magnetic flux density of $B=(1.0a_x + 3.0a_y)$ Wb/m², a current element, $10a_z$ mA/m is placed. Find the force on the current element 6M

UNIT-V

9. Derive Maxwell's equation in time-varying fields and compare with the static electric and steady magnetic fields 14M

(OR)

10. Describe the Poynting theorem and derive its necessary expression with the help of diagram. 14M

AR16

CODE: 16EC2007

SET-1

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)**

II B.Tech II Semester Supplementary Examinations, January-2022

ANALOG COMMUNICATIONS

(Electronics and Communication Engineering)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Derive an expression for AM wave and sketch its frequency spectrum. [7M]
- b) A modulating signal $m(t)=10\cos(2\pi\times 10^3t)$ is amplitude modulated with a carrier signal $c(t)=50\cos(2\pi\times 10^5t)$. Find the modulation index, the carrier power, and the power required for transmitting AM wave. [7M]

(OR)

2. a) With suitable diagram explain the square-law diode modulation method for AM generation? [7M]
- b) A Carrier of 750 W, 1MHz is amplitude modulated by sinusoidal signal of 2 KHz to a depth of 50%. Calculate Bandwidth, Power in side band and total power transmitted. [7M]

UNIT-II

3. a) Draw the block diagram and explain generation of DSB-SC signal using balanced modulator. [7M]
 - b) Explain DSB-SC Time domain and Frequency domain Description [7M]
- (OR)**
4. a) List out the methods for generation of SSB-SC signal and explain any one of the method in detail. [7M]
 - b) Explain Frequency Domain Description of SSB Signal [7M]

UNIT-III

5. a) Explain the principle of Angle Modulation. Derive and explain phase deviation, Modulation index, frequency deviation and percent modulation [7M]
 - b) Explain the Armstrong method of FM generation along with circuit diagram. [7M]
- (OR)**
6. a) Explain Direct Method of FM Generation. [7M]
 - b) Compare the advantages and disadvantages of angle modulation with amplitude modulation [7M]

UNIT-IV

7. a) List out the different Classification of Transmitters and explain any one type in detail. [7M]
 - b) Draw the block diagram of AM Low Level Transmitter and explain its operation. [7M]
- (OR)**
8. a) Explain the Characteristics of RF section. [7M]
 - b) With neat sketch explain the principle of operation of Super heterodyne receiver. [7M]

UNIT-V

9. Explain the PPM generation from PWM with a neat block diagram and necessary figures. [14M]
- (OR)**
10. Define PAM? Explain the generation and demodulation of PAM along with circuit diagram [14M]

AR16

CODE: 16CS2006

SET-2

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)**

II B.Tech II Semester Supplementary Examinations, January-2022

COMPUTER ORGANIZATION AND ARCHITECTURE

(Common to CSE & IT)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Briefly explain about various types of a computer. 7 M
b) Write about functional units of a computer. 7 M
- (OR)
2. a) Convert the following 6 M
(i) $(724)_8 = ()_{10}$ (ii) $(ABC)_{16} = ()_{10}$
b) Briefly explain about floating point representation with example. 8 M

UNIT-II

3. a) Write about hardware implementation for signed-magnitude addition and subtraction with neat flow chart. 7 M
b) Draw & explain about flowchart for division algorithm. 7 M
- (OR)
4. a) Explain about Booth's multiplication algorithm with neat flow chart along with an example. 7 M
b) Write short note on decimal arithmetic unit. 7 M

UNIT-III

5. a) Briefly explain about Logic Micro operations. 7 M
b) Write about shift micro operations with example. 7 M
- (OR)
6. a) Write the two-address, one-address and zero-address instruction formats for the following example. 7 M
 $(X+Y)/(W-Z)*V$
b) Explain about general register organization of a computer with block diagram. 7 M

UNIT-IV

7. a) Draw and explain about ROM chip. 6 M
b) Explain about Virtual Memory? Write about Page Table and TLB (translation- look aside buffer) 8 M
- (OR)
8. a) Write short note on Priority Interrupts? 7 M
b) What is the purpose of DMA? And also briefly explain about DMA Transfer. 7 M

UNIT-V

9. a) Briefly explain about Arithmetic pipeline with flowchart. 7 M
b) Write the application areas of Vector processors and also draw and explain about instruction format for vector processor. 7 M
- (OR)
10. Briefly write about interconnection structures. 14 M

**FLUID MECHANICS AND HYDRAULIC MACHINERY
(Mechanical Engineering)****Time: 3 Hours****Max Marks: 70****PART-A****ANSWER ALL QUESTIONS****[1 x 10 = 10 M]**

1. a) Differentiate between gauge pressure and vacuum pressure.
b) Define a stream line.
c) Define velocity potential function.
d) Differentiate between surface and body forces.
e) Mention different minor losses in pipes.
f) What is a pitot tube? What is its use?
g) What is a draft tube?
h) What is water hammer?
i) Define NPSH.
j) What is priming in centrifugal pump?

PART-B**Answer one question from each unit****[5x12=60M]****UNIT-I**

2. a) What are the properties of fluids and explain. 6M
b) The pressure between two points A and B in a pipe conveying oil of specific gravity 0.8 is measured by an inverted U-tube. The column connected to point B stands 1.6m higher than that at point A. A commercial pressure gauge attached directly to the pipe at A reads 1.125 kg(f)/cm^2 , determine its reading when attached directly to the pipe at B. 6M

(OR)

3. a) Explain the classification of flows. 6M
b) A capillary tube having inside diameter 5mm is dipped in water at 20°C . Determine the height of water which will rise in the tube. Take $\sigma=0.075 \text{ N/m}$ and $\theta=60^\circ$, specific weight of water at 20°C is 9975 N/m^3 . 6M

UNIT-II

4. Derive continuity equation in three dimensional Cartesian coordinate system. 12M

(OR)

5. a) Explain the characteristics of laminar and turbulent flows. 6M
 b) Does the velocity potential exist for two dimensional incompressible flow prescribed by $u = x-4y$; $v = -(y+4x)$. If so, determine velocity potential function and stream function. 6M

UNIT-III

6. a) Derive Darcy Weisbach equation. 6M
 b) Water flows at the rate of $0.015 \text{ m}^3/\text{s}$ through a 100 mm diameter orifice used in a 200 mm pipe. What is the difference of pressure head between the upstream section and the vena contracta section? Take coefficient of contraction $C_c = 0.60$ and $C_v = 1.0$. 6M

(OR)

7. What is a Venturimeter? Explain the working of a venturimeter with a neat sketch. 12M

UNIT-IV

8. Design a Pelton turbine to develop 103 KW shaft power at 300 r.p.m. when net head available is 80 m. Take $C_v = 0.95$, $\eta_0 = 80\%$ and speed ratio = 0.45. 12M

(OR)

9. a) Explain different efficiencies of turbines. 6M
 b) What is governing of turbines? Explain. 6M

UNIT-V

10. A centrifugal pump has the following characteristics: outer diameter of impeller=800mm, width of impeller vane at outlet=100mm, angle of impeller vanes at outlet = 40° . The impeller runs at 550 rpm and delivers $0.98 \text{ m}^3/\text{s}$ of water under an effective head of 35m. A 500 kW motor is used to drive the pump. Determine the manometric, mechanical and overall efficiencies of the pump. Assume water enters the impeller vanes radially at inlet. 12M

(OR)

11. a) Explain the working of a reciprocating pump with a neat sketch 6M
 b) Explain the main characteristic curves of centrifugal pump. 6M