AR18

CODE: 18CET202   **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech I Semester Supplementary Examinations, January-2020
FLUID MECHANICS-I
(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) What is capillarity? Derive the expression for capillary rise in a glass   (6 M)
        tube of diameter 'd', when it is dipped in a liquid of surface tension
        'σ', specific weight 'γ' and contact angle 'θ'.

    b) A cubical tank has sides of 2.4m. It contains water for the lower 0.6m   (6 M)
        depth. The upper remaining part is filled with oil of specific gravity
        0.7. Calculate total pressure and centre of pressure for one vertical
        side of the tank.

(OR)

2.   A U- tube manometer is used to measure the pressure of water in a   (12M)
        pipe line, which is in excess of atmospheric pressure. The right limb
        of manometer is open to atmosphere and contains mercury.
        Determine the pressure in the pipe line, if the difference in level of
        mercury in the limbs of U-tube is 10 cm and the free surface of
        mercury is in level with the centre of pipe. If the pressure reduced to
        9810 N/m^2, calculate the new difference in the level of mercury.

UNIT-II

3. a) Prove that the location of centre of pressure is lies below the centre of   (6 M)
        gravity when a plane surface is submerged in vertical.

    b) Find the Meta centric height for a wooden block of width 3 m and   (6 M)
        depth 2 m, when it floats horizontally in water. The density of wooden
        block is 700 kg/m^3 and its length is 6 m.

(OR)

4. a) Find the location and magnitude of hydrostatic force on an inclined   (6 M)
        rectangular plate of width 0.3 m depth 0.6 m of inclination of 30^0 with
        the water surface when the top of the plate is 2 m below the free water
        surface.

    b) Define metacentric height and also derive its expression.   (6 M)

UNIT-III

5. a) What is stream and velocity potential function and mention their properties. (6 M)

   b) The velocity potential function is given by an expression $\emptyset = (-xy^3/3)$ $-(x^2) + (x^3y/3) + (y^2)$ find the velocity components in x and y direction and show that $\emptyset$ represents a possible case of flow. (6 M)

(OR)

6. The velocity vector in a fluid flow is given by $V = 2x^3i-5x^2yj+4tk$. Find the acceleration at (2,3,5) at time t=1 sec. (12M)

UNIT-IV

7. 250 lit/s of water is flowing in a pipe having a diameter of 300 mm. If the pipe is bent by 45^0, find the magnitude and direction of resultant force on the bend. The pressure of the water flowing is 400 kN/m^2. Take specific weight of water as 9.81 kN/m^3. (12M)

(OR)

8. a) Write Euler's equation and derive the Bernoulli's equation from it. (6 M)

   b) A pipe line carrying oil of specific gravity 0.8, changes in diameter from 200mm diameter at a position A to 500mm diameter at position B which is 4m at a higher level. If the pressures at A and B are 9.81N/cm^2 and 4.9 N/cm^2 respectively and the discharge is 300 liters/sec. Determine the loss of head and direction of flow. (6 M)

UNIT-V

9. A pipe of diameter 300 mm and length 1200 m connects two reservoirs, having difference of water levels as 12 m. Determine the discharge through the pipe. If an additional pipe of diameter 300 mm and length 600 m is attached to the last 600 m length of the existing pipe, find the increase in the discharge. Take friction factor f=0.02 and neglect minor losses. (12M)

(OR)

10. a) Derive the expression for the discharge through a Venturimeter. (6 M)

   b) A right angled V – Notch is used for measuring a discharge of 40 liters/sec. An error of 1.5 mm was made while measuring the head over the notch. Calculate the percentage error in the discharge. Take C_d as 0.6. (6 M)

AR18

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech I Semester Supplementary Examinations, January-2020
ELECTRO MAGNETIC FIELD THEORY
(Electrical and Electronics 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) Three point charges are positioned in the x-y plane as follows: 5 nC **(5M)** at $y = 0.05$ m, -10 nC at $y = -0.05$ m, and 15 nC at $x = -0.05$ m. Find the required x-y coordinates of a 20-nC fourth charge that will produce a zero electric field at the origin.
   b) By applying Coulomb's law, derive an expression for **E** due to a **(7M)** charged ring of radius a carrying a uniform charge λ C/m and is placed on the x-y plane with its axis on the z-axis.

(OR)

2. a) Calculate approximate value for the total charge enclosed in an **(5M)** incremental volume of 10^{-9} m^3 located at the origin, if $\mathbf{D} = e^{-x} \sin y$ $\mathbf{a}_x - e^{-x} \cos y\, \mathbf{a}_y + 2z\mathbf{a}_z$ C/m^2.
   b) State Gauss's law? Using Gauss's law find **E** due to a infinite line of **(7M)** charge lying along Z axis.

UNIT-II

3. a) Derive the expressions for boundary conditions between dielectric **(7M)** and dielectric?
   b) A coaxial conductor has radii $a = 0.0008$ m and $b = 0.003$ m and a **(5M)** polystyrene dielectric for which $\varepsilon_r = 2.56$. If $\mathbf{P} = (2/\rho)\mathbf{a}_\rho$ nC/m^2 in the dielectric, find **D** and **E** as functions of ρ.

(OR)

4. a) Derive Laplace's and Poisson's equations. **(6M)**
   b) A parallel-plate capacitor is made using two circular plates of radius **(6M)** a, with the bottom plate on the xy plane, centered at the origin. The top plate is located at $z = d$, with its center on the z axis. Potential V0 is on the top plate; the bottom plate is grounded. Dielectric having radially dependent permittivity fills the region between plates. The permittivity is given by $\epsilon(\rho) = \epsilon_0(1 + \rho^2/a^2)$. Calculate Q and C.

5. a) State and explain Biot-Savart's law. **(6M)**
    b) Derive Maxwell's third equation curl($\mathbf{H}$) = $\mathbf{J}$. **(6M)**

(OR)

6. a) A toroid having a cross section of rectangular shape is defined by **(6M)** the following surfaces: the cylinders $\rho = 0.02$ and $\rho = 0.03$ m, and the planes $z = 0.01$ and $z = 0.025$ m. The toroid carries a surface current density of $-50\mathbf{a}_z$ A/m on the surface $\rho = 0.03$ m. Find $\mathbf{H}$ at the point $P(\rho, \varphi, z)$:
       (a) $P_A(0.015$ m, 0, 0.02 m); (b) $P_B(0.021$ m, 0, 0.02 m);
       (c) $P_C(0.027$ m, 0.0157 m , 0.02 m); (d) $P_D(0.035$ m, 0.0157 m, 0.02 m).
    b) A filamentary conductor is formed into an equilateral triangle with **(6M)** sides of length l carrying current I. Find the magnetic field intensity at the center of the triangle, using Biot-Savart's law.

UNIT-IV

7. a) Derive the expression for force between two straight long and **(6M)** parallel conductors carrying current in the same direction.
    b) A point charge for which $Q = 2 \times 10^{-16}$ C and $m = 5 \times 10^{-26}$ kg is **(6M)** moving in the combined fields $\mathbf{E} = 100\mathbf{a}_x - 200\mathbf{a}_y + 300\mathbf{a}_z$ V/m and $\mathbf{B} = -3\mathbf{a}_x + 2\mathbf{a}_y - \mathbf{a}_z$ mT. If the charge velocity at $t = 0$ is $\mathbf{v}(0) = (2\mathbf{a}x - 3\mathbf{a}y - 4\mathbf{a}z)10^5$ m/s (a) give the unit vector showing the direction in which the charge is accelerating at $t = 0$; (b) find the kinetic energy of the charge at $t = 0$.

(OR)

8. a) Derive an expression for torque experienced by a current loop **(8M)** placed in a magnetic field.
    b) Derive an expression for inductance of a solenoid with length l and **(4M)** N turns.

UNIT-V

9. a) Derive an expression for modified Ampere's law for time varying **(8M)** fields.
    b) Find the displacement current density associated with the magnetic **(4M)** field
       $\mathbf{H} = A_1 \sin(4x) \cos(\omega t - \beta z) \, \mathbf{a}_x + A_2 \cos(4x) \sin(\omega t - \beta z) \, \mathbf{a}_z$.

(OR)

10. a) State and prove Poynting theorem. **(8M)**
    b) Given $\mathbf{H} = 300 \, \mathbf{a}_z \cos(3 \times 10^8 t - y)$ A/m in free space, find the emf **(4M)** developed in the general $\mathbf{a}_\varphi$ direction about the closed path having corners at
       (i) (0, 0, 0), (1, 0, 0), (1, 1, 0), and (0, 1, 0);
       (ii) (0, 0, 0) (2π, 0, 0), (2π, 2π, 0), and (0, 2π, 0).

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ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech I Semester Supplementary Examinations, January-2020
ENGINEERING MECHANICS
(Common to ME & ECE)

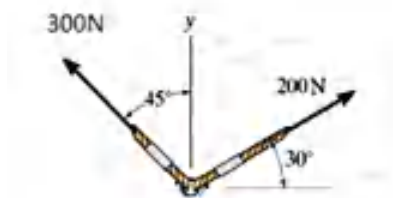Time: 3 Hours   Max Marks: 60

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I
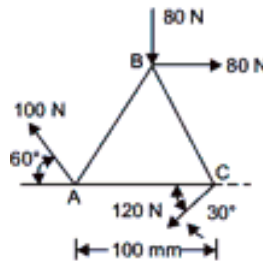
1. a) Explain the following: (6M)
      i) Parallelogram law of forces   ii) Resultant of concurrent force
         systems
   b) Determine the magnitude of the resultant force R. Use Parallelogram
      law of forces.

                                                                        (6M)
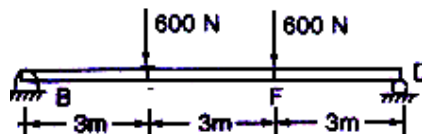
(OR)

2. a) Explain different types of force systems.   (4M)
   b) Find the resultant and direction of the force system shown in figure
      acting on a lamina of equilateral triangular shape.   (8M)

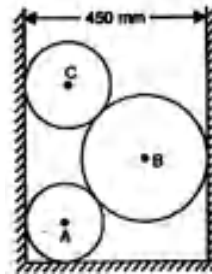## UNIT-II

3. a) State and prove Varignon's theorem.   (4M)
   b) The beam BD is supported and loaded as shown in figure. Determine
      the reactions at the points B and D.   (8M)

(OR)

4. Three cylinders are piled in a rectangular ditch as shown in figure. Neglecting, friction, determine the reactions at the points of support. Weights and radii of the cylinders are as given below: (12M)

| Cylinder	Weight	Radius
A	75	100
B	200	150
C	100	125

UNIT-III

5. a) What do you understand by the term friction and state the characteristics of friction. (4M)

   b) A block of weight $W_1 = 1000$ N rests on a horizontal surface and supports on its top another block of weight $W_2 = 250$ N as shown in figure. The weight W_2 is attached by an inclined string AB to the vertical Wall. Find the magnitude of the horizontal force P applied to the lower block to cause slipping to impend. The coefficient of friction for all contacting surfaces may be assumed to $\mu = 0.3$. (8M)
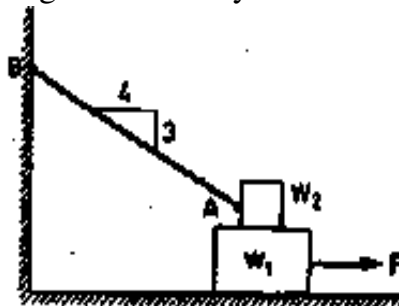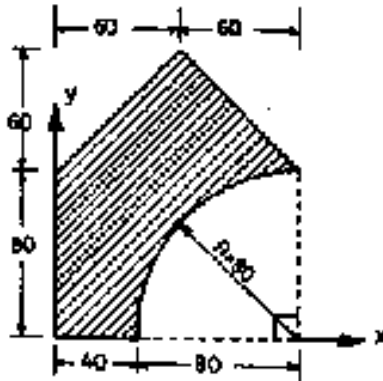

(OR)

6. Determine the forces in all the members of the truss shown in figure and indicate whether they are in tension or compression. (12M)
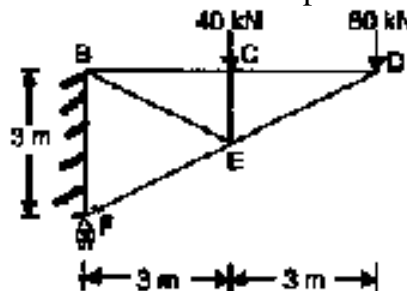
UNIT-IV

7. a) Determine the centroid coordinates of semicircular area of radius 'R' by integration method. (6M)

   b) Find the coordinates of the centroid of the shaded area shown in figure with respect to the x and y axes. (6M)


(OR)

8. a) Briefly explain the following: (6M)
   i) Moment of inertia   ii) Polar moment of inertia
   ii) Radius of gyration

   b) Derive the formula for moment of inertia of an area of a triangle of base 'b' and height 'h' about its centroidal axis parallel to its base, from basic principles. (6M)

UNIT-V

9. a) A stone is dropped into a well and the sound of splash is heard after 5 seconds. Assuming the velocity of sound to be 340 m/s, find the depth of the well. (4M)

   b) A fly-wheel, which accelerates at uniform velocity, is observed to have made 100 revolutions to increase its velocity from 120 rpm to 160 rpm. If the flywheel originally started from rest, determine (i) the value of acceleration, (ii) time taken to increase the velocity from 120 rpm to 160 rpm and (iii) revolutions made in reaching a velocity of 160 rpm, starting from rest. (8M)

(OR)

10. Three blocks A, B and C are connected as shown in figure. Find the acceleration of masses and tension T_1 and T_2 in the strings. Given μ_1 = 0.2 and $\mu_2 = 0.25$. (12M)
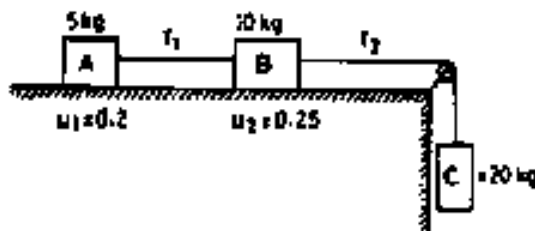
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AR18

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech I Semester Supplementary Examinations, January-2020

DISCRETE MATHEMATICS
(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) Construct the truth table for the following proposition   6M
        $\{[(p \lor q) \to r] \land (\sim p)\} \to (p \to r)$

    b) Obtain the PCNF of formula $(\sim P \to R) \land (Q \leftrightarrow P)$ 6M

(OR)

2. a) State the converse, opposite and contra positive to the following   6M
        (i) If $\triangle$ABC is a right triangle then $|AB|^2 + |BC|^2 = |AC|^2$
        (ii) If the triangle is equiangular, then it is equilateral

    b) Show that the following premises are inconsistent.   6M
        "If Jack misses many classes through illness, then he fails high school.
        If Jack fails high school, then he is uneducated. If Jack reads a lot of
        books, then he is not uneducated. Jack misses many classes through
        illness and reads a lot of books."

UNIT-II

3. a) Let S be the set of all non-zero integers and A= SXS. If Ris a relation   6M
        on A given by (a,b) R (c,d) if and only if ad = bc. Show that R is an
        equivalence relation.

    b) For the poset $[D_{20};\ /\ ]$ draw a poset diagram. Also specify whether it is   6M
        a lattice or not

(OR)

4. a) Consider the function f: $R \to R$ given by $f(x) = x^3 + 1$. Prove that f is   6M
        one-to-one and maps R onto R

    b) Consider A=B=C=R and let f:A $\to$B and g:B$\to$C be defined by f(x)=   6M
        x+9 and g(y)= y^2+3. Find   (i) fog(a)   (ii) gof(b) (iii) fog(-3)
        (iv) gof(3)

UNIT-III

5. a) Prove that the number of odd degree vertices are always even in any simple undirected graph   6M

    b) Define adjacency matrix and find the adjacency matrix for   6M

    (i) k_4 (ii) w_4

(OR)

6. a) Verify whether the following graphs are isomorphic or not   6M

    b) A connected plane graph G has 10 vertices, each of degree 3. Into how many regions, does a representation of this planar graph split the plane   6M

UNIT-IV

7. a) State and prove Euler's formula for a connected planar graph   6M

    b) Show that a complete graph k_n is planar if $n \leq 4$ 6M

(OR)

8. a) Define chromatic number. What is the chromatic number of a cycle.   6M

    b) Given the pre order and in order traversal of a binary tree, draw the unique tree   6M

    Pre order : g b q a c p d e r

    In order : q b c a g p e d r

UNIT-V

9. a) Find the coefficient of x^{10} in $(x^3 + x^4 + \ldots\ldots\ldots)^2$ 6M

    b) Solve the recurrence relation $a_{n} - 2a_{n-1} + a_{n-2} = 5n$ for $n \geq 2$ 6M

(OR)

10.   Solve non-homogeneous recurrence relation $a_n - 7a_{n-1} + 10\,a_{n-2} = 4^n$ for $n \geq 2$ and $a_0 = 8$, $a_1 = 36$ 12M

AR16

CODE: 16CE2003　　　　　　　　　　　　　　　　　**SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech I Semester Supplementary Examinations, January-2020
FLUID MECHANICS
(CIVIL 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) Define the following physical properties of fluids and mention their SI units and dimensions:　　9M
   i) Viscosity ii) Vapour Pressure iii) Specific Gravity
   b) Calculate the gauge pressure and absolute pressure within droplet of water 0.4 cm in diameter. Assume the surface tension of water as 0.073N/m and atmospheric pressure as 101.3kPa.　　5M

(OR)

2. a) Derive the equation for measuring the difference of pressure between two points using U-tube differential manometer.　　8M
   b) A plate having an area of $0.6m^2$ is sliding down the inclined plane at an angle of 30^0 to the horizontal with a velocity of 0.36m/s, there is a cushion of fluid 1.8mm thick between the plane and the plate. Find the viscosity of fluid if the weight of plate is 280N.　　6M

UNIT-II

3. a) A tank 20m deep and 9 m wide is filled with water up to a depth of 18m from the bottom. Determine the total hydrostatic force and centre of pressure on one side of the tank.　　8M
   b) Explain the conditions of stability for floating and submerged bodies.　　6M

(OR)

4. a) How do you find the hydrostatic force exerted on a curved surface?　　7M
   b) What is metacentric height? How do you determine it?　　7M

UNIT-III

5. a) Classify various types of fluid flows.　　6M
   b) The flow field of a fluid is given by V = (xy) i + (2yz) j – (yz+z^2) k   a) Show that it represents a possible flow field b) is this flow rotational or irrotational? If it is rotational flow, determine angular velocity at the point (2, 4, 6).　　8M

(OR)

6. a) Derive one dimensional continuity equation.　　8M
   b) If the velocity potential function Ø= 3xy, determine the discharge passing between the stream lines passing through the points (1, 3) and (3, 3).　　6M

UNIT-IV

7. a) Derive Bernoulli's equation for flow along a streamline. 8M
   b) The rate at which water flows through a horizontal pipe of 25 cm diameter is increased linearly from a discharge of 30 liters per second to 150 liters per second in 3.5 seconds. What pressure gradient must exist to produce this acceleration? What difference in pressure intensity will prevail between two points located in the pipe of 8 m apart? Take density of water as 1000 kg/m^3. 6M

(OR)

8. a) Show that for a steady laminar flow in a long circular tube , f= 64/R$_N$ 8M
      where f =friction factor and R$_N$ = Reynold's Number
   b) Determine the force exerted by the pipe boundary on the fluid for the following case. P$_1$ = 245.2 kN/m^2; V$_1$ = 4 m/s; d$_1$ = 30 cm; d$_2$ = 15 cm; density = 1000 kg/m^3, Assume that the 90° pipe bend is in the horizontal plane. 6M

UNIT-V

9. a) An existing 300 mm diameter pipeline of length 3200 m connects two reservoirs with 13 m difference in their water levels. Calculate the discharge. If a parallel pipe 30 cm diameter is attached to the last 1600 m length of the existing pipeline, find the new discharge. Take only wall friction into consideration. Assume f = 0.04 in Darcy-Weisbach Equation. 8M
   b) What is the Moody's Chart? Explain its significance. 6M

(OR)

10. a) Explain the necessity of ventilation in weirs (with figures wherever necessary). 8M
    b) Determine the height of a rectangular weir of length 6 m to be built across a rectangular channel where the maximum depth of water is 1.8 m and discharge is 2000 litres/s. Take C$_d$ = 0.6 and neglect end contractions. 6M

AR16

CODE: 16ME2005   **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech I Semester Supplementary Examinations, January-2020
MECHANICS OF SOLIDS
(Mechanical 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) Define and explain the concept of factor of safety.   4 M
   b) A member ABCD is subjected to point loads P1, P2, P3 and P4 as shown in the Fig. Calculate force P2 necessary for equilibrium if P1= 45 kN, P3= 450 kN and P4 = 130 kN. Determine the total elongation in the member by assuming E= $2X10^5$ N/mm^2 A$_1$=625mm^2, A$_2$=2500mm^2, A$_3$=1250mm^2 10 M
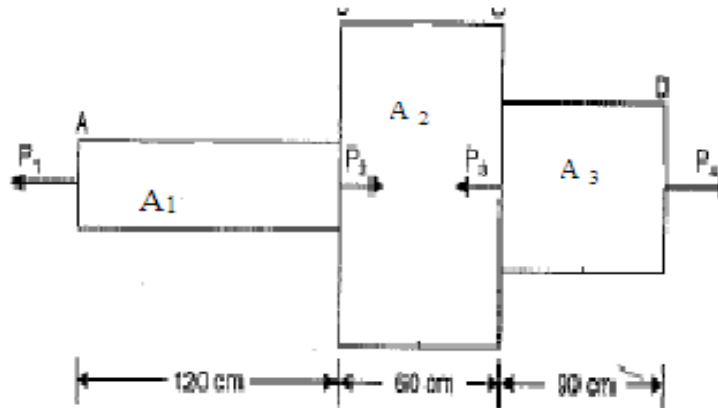
(OR)

2. a) Define the following i) Hooke's law ii) Poisson's ratio   4 M
   b) A gun metal rod 22 mm diameter screwed at the ends passes through a steel tube of 25 mm and 30 mm internal and external diameters. The temperature of the whole assembly is raised to 126 °C and the nuts on the rod are then screwed lightly on the ends of the tube. Find the intensity of stress in the rod and the tube when the common temperature has fallen to 16°C. Take E$_S$ = 210 GPa, E$_G$ = 94 GPa, α$_s$=0.000012/°C, α$_G$=0.00002/°C.   10 M

UNIT-II

3. At a point with in a body subjected to two mutually perpendicular directions, the stresses are 80 N/mm^2 tensile and 40 N/mm^2 tensile. Each of the above the stress is accompanied by shear stress of 60 N/mm^2. Determine the normal stress, shear stress and resultant stresses on an oblique plane inclined at an angle of 45^0 with the axis of minor tensile stress. Also determine maximum principal and shear stress?   14 M

(OR)

4. A beam of span 10 m is simply supported at two points 6m apart with equal over-hang on either side. Both the overhanging portions are loaded with a uniformly distributed load of 2 kN/m run and the beam also carries a concentrated load of 10 kN at the mid span. Construct the SF and BM diagrams and locate the points of inflexion, if any.   14 M

UNIT-III

5. A cast iron beam has an I-section with top flange 10 0mm × 40 mm, web 140 mm×20 mm and bottom flange 180mm × 40mm. If tensile stress is not to exceed 35MPa and compressive stress 95MPa, what is the maximum uniformly distributed load the beam can carry over a simply supported span of 6.5 m if the larger flange is in tension.   **14 M**

(OR)

6. The unsymmetrical I-section as shown in Figure is subjected to a shear force of 100 kN. Draw the shear stress variation diagram across the depth.

14 M
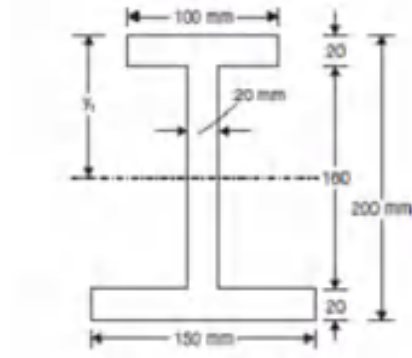
UNIT-IV

7. a) What are the assumptions in the theory of pure torsion   **4 M**
   b) Derive the torsion formula?   **10 M**

(OR)

8. A simply supported beam of 4 m is subjected to uniformly distributed load of 30 kN/m over the whole span and deflects 15 mm at the centre. Determine the crippling loads when this beam is used as column with the following conditions.   **14 M**
   i) One end is fixed and other end is hinged
   ii) Both the ends pin jointed

UNIT-V

9. Determine the following for an overhanging beam supported at A and loaded as shown in Figure. i) Deflection at the free end, ii) maximum deflection between A and B. Take E= 2.1×10^8kN/m^2.

14 M
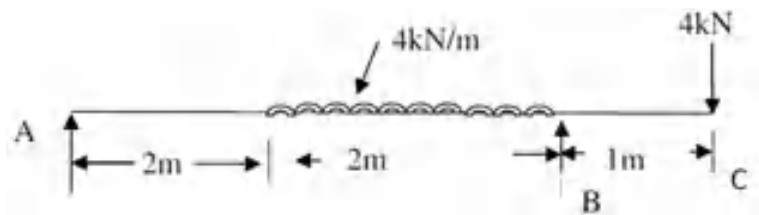
(OR)

10. A simply supported beam A B of span 6 meters and of flexural rigidity EI = 8 $\times10^4$kN – m^2 is subjected to a clockwise couple of 60 kN-m at a distance of 4 m from the left end. Find the deflection at the point of application of the couple and the maximum deflection and slope.   **14 M**

AR16

CODE: 16EC2004   **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech I Semester Supplementary Examinations, January-2020

PULSE AND DIGITAL CIRCUITS
(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) A pulse of amplitude 10 V and duration 10 μs is applied to a high-pass RC 7
Sketch the output waveform indicating the voltage levels for (i) $RC = t_p$, (ii) $RC = 0.5t_p$ and
(iii) $RC = 2t_p$.

   b) Derive an expression for output of low-pass RC circuit excited by ramp input   7
   (OR)
2. Show that RC high pass circuits acts as a differentiator and also derive response of RC high   14
pass circuit to the step input

UNIT-II

3. a) Draw a circuit to transmit that part of a sine wave, which is below + 6 V   7
   (Clipping above ref. .level)
   b) Draw the emitter coupled clipper, explain its operation and discuss its transfer characteristics   7
   (OR)
4. a) Design a types of clampers with suitable diagrams   7

   b) State and prove the clamping circuit theorem.   7

UNIT-III

5. Explain in detail about transistor switching times   14
   (OR)
6. a) Explain in detail about the principle of operation of Bi-stable multivibrator?   7
   b) A fixed bias binary uses transistors with Hfe(min)=20.The circuit parameters are   7
   Vcc=12V,Vbb=-3V,Rc=1k,R2=10k,Vce(sat)=0.3V and Vbe(sat)=0.7V.Find
   (i)Steady state voltages and currents
   (ii)What is the heaviest load it can drive, still maintaining one transistor in cutoff and the
   other in saturation.
   (iii)Find the maximum Icbo tolerated.

UNIT-IV

7. a)   With neat circuit, explain about transistor miller time base generator?   7
      b)   Derive expression for the pulse width of astable multivibrator?   7

(OR)

8. a)   Explain the working of transistor based Bootstrap time base generator circuit, and draw the   7
          necessary waveforms.
      b)   Explain all the types of errors in time base generator with formulas and necessary   7
          waveforms.

UNIT-V

9. a)   Calculate the pulse width of a monostable blocking oscillator with base timing   7
      b)   How to cancel the pedestal in a sampling gate? Discuss with suitable circuit diagram?   7

(OR)

10. a)   With the help of neat circuit diagram explain the working of an astable blocking   7
          oscillator with R-C control
      b)   Give the applications of sampling gates?   7

AR16

CODE: 16CS2003   **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech I Semester Supplementary Examinations, January-2020

MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE
(Computer Science and 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
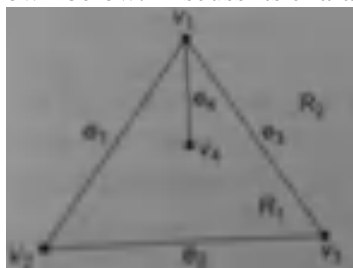
UNIT-I

1. a) Define PCNF & PDNF. Find the PCNF of the formula $(\neg P \rightarrow R) \wedge (Q \rightleftarrows P)$ 7M
   b) State rules of inference. Show that R V S follows logically from the premises   7M
   C V D, (C V D) $\rightarrow \neg$H, $\neg$H $\rightarrow$ (A $\wedge \neg$B) and (A $\wedge \neg$B) $\rightarrow$ (R V S)

   (OR)

2. a) Explain how do we arrive at converse, inverse and contra positive of a statement.   7M
   Write Converse, Inverse and contra positive of the following statement: "The home
   team does not win whenever it is raining"
   b) Show that n^3-n is divisible by 3 using Mathematical Induction whenever n is   7M
   positive integer

UNIT-II

3. a) Explain lattice along with one example. What are its properties?   7M
   b) Define one-one and onto functions. Consider f:$Z^+ \rightarrow Z^+$ defined by f(a) = a^2 Check   7M
   it is one-one and onto using suitable explanation

   (OR)

4. a) Arrive at pictorial representation of composition of two functions. Let the functions   7M
   f & g are defined by f(x) = 2x+1 g(x) = x^2 – 2 Find f o g and g o f
   b) State pigeon hole principle and explain its applications. In a group of 13 children   7M
   show that there must be atleast 2 children who were born on the same month.

UNIT-III

5. a) What is chromatic number? Draw $K_{3,3}$ graph and find the chromatic number of $K_{3,3}$ 7M
   b) What is Bipartite graph? Show that C_6 is a Bipartite graph   7M

   (OR)

6. a) Illustrate difference between incidence and adjacency matrices with appropriate   7M
   example.
   b) Consider the graph G as shown below. Discuss its characteristics   7M

UNIT-IV

7. a) Explain with an example how to find minimal spanning tree using Prims algorithm   7M
   b) What are the conditions to be satisfied for a Graph to be considered as a tree?   7M
   Explain with example. List atleast 3 properties of Tree

(OR)

8. Define what is a spanning tree. Write steps involved in BFS algorithm. Find a   14M
   spanning tree of a graph G as given below using BFS alogorithm
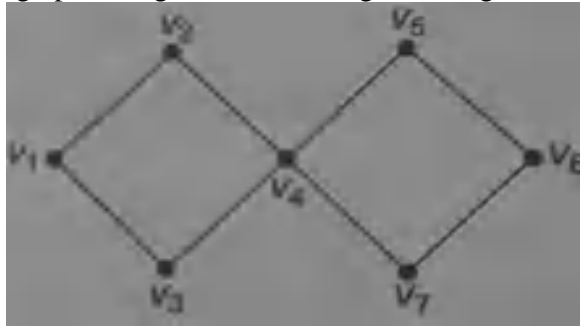
UNIT-V

9. Explain about generating functions and its applications. Use generating functions   14M
   to solve the following: $a_n - 2a_{n-1} - 3a_{n-2} = 0$ $n >= 2$ $a0 = 3$ $a1 = 1$

(OR)

10. a) Solve the recurrence relation: $L_n = L_{n-1} + L_{n-2}$ $L_0 = 2$ $L_1 = 1$ 7M
    b) What is purpose of recurrence relation? Explain with examples. How recurrence   7M
    relations can be solved

Time: 3 Hours   Max Marks: 70

PART-A

ANSWER ALL QUESTIONS   **[1 x 10 = 10 M]**

1. a) How does viscosity affect fluid motion?   **1M**
   b) State any two examples where the principle of Pascal's law is applied.   **1M**
   c) Define the term 'total pressure' on immersed body.   **1M**
   d) Write the expression for centre of pressure of a inclined plane surface   **1M**
      submerged in a static liquid.
   e) Differentiate between rotational and irrotational flows.   **1M**
   f) Write any two properties of stream function?   **1M**
   g) Name the different forces present in a fluid flow. For the Euler's   **1M**
      equation of motion, which forces are taken into consideration.
   h) Draw velocity distribution for a turbulent flow in a circular pipe.   **1M**
   i) What do you understand by the terms major energy loss and minor   **1M**
      energy loss in pipes?
   j) What is Vena-contracta?   **1M**

PART-B

Answer one question from each unit   **[5x12=60M]**

UNIT-I

2. a) State and prove Pascal's law.   6M
   b) A plate weighing 150 N and measuring 0.8 m x 0.8 m slides down an   6M
      inclined plane over an oil film of 1.2 mm thickness. For an inclination
      of 30° and a velocity of 0.2 m/s, compute viscosity of the fluid.

(OR)

3. a) What is the difference between U-tube differential manometer and   6M
      inverted U-tube   differential Manometers? Where are they used?
   b) Define and derive Newton's law of viscosity.   6M

UNIT-II

4. a) Show that the centre of pressure of any lamina immersed under liquid   6M
      is always below its centroid.
   b) A rectangular plane surface 2m wide and 3m deep lies in water in such   6M
      a way that its plane makes an angle of 30^0 with the free surface of
      water. Determine the total pressure and position of centre of pressure
      when the upper edge is 1.5m below the free surface?

(OR)

5. a) Prove that the total pressure exerted by a static liquid on an inclined
      plane
      submerged surface is the same as the force exerted on a vertical plane   6M
      surface as long as the depth of centre of gravity of the surface is
      unaltered.
   b) Find the magnitude and direction of the resultant force due to water   6M
      acting on a roller gate of cylindrical form of 4 m diameter, when the
      gate is placed on the dam in such a way that water is just going to spill.
      Take the length of the gate as 8 m.

UNIT-III

6. a) Define and derive continuity equation in 3-dimensional flow.   6M
   b) The stream function $\psi=8xy$. Calculate the velocity at the point (4,5). 6M Find the velocity potential function ϕ?

<div align="center">(OR)</div>

7. a) Describe the uses and limitations of flownets.   6M
   b) The velocity potential function is given by an expression $\phi=x^2-y^2$. Find 6M the velocity components in x and y direction and show that ϕ represents a possible case of flow?

UNIT-IV

8. a) Derive Bernoulli equation from Euler's equation of motion for one 6M dimensional flow and state its limitations.
   b) A 30cm diameter pipe carries water under a head of 20m with a 6M velocity of 3.5m/s. If the axis of pipe turns through 45^0, find the magnitude and direction of the resultant force on the bend.

<div align="center">(OR)</div>

9. a) Describe Reynolds's experiment to demonstrate the two types of flow 6M in detail.
   b) The water is flowing through a pipe having diameters 20 cm and 10 6M cm at sections 1 and 2 respectively. The rate of flow through pipe is 35 litres/s. The section 1 is 6m above the datum and section 2 is 4m above the datum. If the pressure at section 1 is 39.24 N/cm^2, find the intensity of pressure at section 2.

UNIT-V

10. a) Obtain an expression for discharge through a Triangular Notch?   6M
    b) Define and explain the terms: (i) Hydraulic gradient line and (ii) total 6M energy line

<div align="center">(OR)</div>

11. a) Determine the loss of head due to friction in pipes by using Darcy- 6M Weisbach equation.
    b) What is a Venturimeter? Derive the expression for the discharge 6M through a venturimeter.

AR13

PART-A

ANSWER ALL QUESTIONS   **[1 x 10 = 10 M]**

1. a) Give the significance of Curl function in electromagentics.
    b) Give an expression for potential due to point charge.
    c) Define dipole moment.
    d) Write Laplace's equation.
    e) State Ampere's Law.
    f) Give expression for Magnetic field intensity due to solenoid.
    g) List Lorentz force equation?
    h) Define self inductance.
    i) Write Faraday's law in integral form.
    j) Interpret the necessary conditions to produce emf?

PART-B

Answer one question from each unit   **[5x12=60M]**

UNIT-I

2. a) Define and explain the physical significance of the following   6M
        (i). Divergence   (ii). Gradient   (iii). Curl
    b) Determine the electric field intensity **E** at P(1,1,1) caused by four   6M
        identical 3nC charger located at $P_1(1,1,0)$, P_2 (-1,1,0), P_3(-1,-1,0) and
        P_4(1,-1,0).

(OR)

3. a) Transform the vector B= $y\mathbf{a}_x$ - $x\mathbf{a}_y$ +$z\mathbf{a}_z$ into cylindrical and spherical   6M
        coordinates.
    b) By applying Coulomb's law, derive an expression for E due to a   6M
        charged ring of radius a carrying a uniform charge λ C/m and is placed
        on the x-y plane with its axis on the z-axis.

UNIT-II

4. a) Derive the expression for Laplace and Poissons equations from   6M
        fundamentals.
    b) An electric dipole of 100 $\mathbf{a}_z$ pC, m is located at the origin. Find V and   6M
        E at (0, 0, 10).

5. a) Derive boundary conditions between two perfect dielectrics in electrostatics. 6M

   b) Find the capacitance of a 10Km long coaxial cable whose inner radius is 1cm and outer 1.6 cm. 6M

UNIT-III

6. a) By using Biot Savarts law derive an expression for H due to circular ring carrying current I. 6M

   b) State Ampere's circuit law and derive an expression for differential form of ampere's circuit law. 6M

(OR)

7. a) Determine the magnetic field intensity, at the centre of the square current element. The length of each side is 2m and the current is I=1A. 5M

   b) For a coaxial cable, derive expressions for **H** and plot **H** with respect to distance. 7M

UNIT-IV

8. a) Discuss motion of charge particle in magnetic field. 6M

   b) Derive the expression for force between two current carrying conductors on the same direction. 6M

(OR)

9. a) Derive the expression for Lorentz force equation. 6M

   b) Derive the expression for the torque on a current loop placed in magnetic field. 6M

UNIT-V

10. a) Derive the expression for self-inductance of solenoid. 6M

    b) Explain faraday's laws of electromagnetic induction and from that derive related Maxwell's equation. 6M

(OR)

11. State and prove Poynting theorem. 12M

Code: 13EC2005   **Set-II**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech I Semester Supplementary Examinations, January-2020

PROBABILITY THEORY & STOCHASTIC PROCESSES
(Electronics and Communication Engineering)

Time: 3 hours   **Max. Marks: 70M**

PART - A

Answer all questions   **[10 X 1 = 10]**

1. a) When two events are said to be collectively exhaustive events?
   b) What do you mean by relative frequency?
   c) Show that the area under the exponential curve is unity?
   d) Write any two properties of distribution function?
   e) Define moment generating function of two random variables.
   f) What is the probability distribution function of sum of two random variables?
   g) Define cross covariance function of two random processes.
   h) What is the difference between random sequence and random process?
   i) Give the mathematical expression for noise figure.
   j) What are the different noise sources that may present in an electronic device?

PART - B

Answer one question from each unit   **[5 X 12 = 60M]**

UNIT-I

2.a If A and B are independent events such that P(B) = 3/5 and $P\left(A \cup \overline{B}\right) = 0.75$ then P(A).   6M

 b In a class 60% of the students are boys and the remaining are girls. It is known that the   6M
    probability of a boy getting distinction is 0.30 and that of girl getting distinction is 0.35.
    Find the probability that a student chosen at random will get distinction.

(OR)

3.a State and prove Baye's theorem.   6M

 b A mechanical system consists of two subsystems A and B. Given P(A fails) = 0.20,   6M
    P(B fails alone) = 0.15, P(A and B fail) = 0.15.   From the following probabilities, find :
       (a) P(A fails / B has failed)
       (b) P(A fails alone)

UNIT-II

4.a Find the mean and variance of a uniform distribution.   6M

 b If X has a uniform distribution in (-a, a), a > 0, find 'a' such that P(|X|<1) = P(|X|>1).   6M

(OR)

5.a Explain the distribution function and derive its properties.   6M

 b Explain Gaussian density and distribution function.   6M

UNIT-III

6.a State and explain the properties of joint probability density function. 6M

 b Find a constant b so that the function $f_{X,Y}(x,y) = \begin{cases} b\,e^{-(x+y)} ; & 0 < x > a, 0 < y < \infty \\ \quad 0 ; & elsewhere \\ b = \dfrac{1}{1-e^{-a}} \end{cases}$. Is a 6M

 valid joint density function. Check whether X and Y are independent.

(OR)

7.a Prove the following: 6M
  a) $Cov(aX + bY) = ab\,Cov(X,Y)$
  b) $Var(aX + bY) = a^2\,Var(X) + b^2\,Var(Y) + 2ab\,Cov(X,Y)$

 b Two random variables X and Y have the following joint probability density function 6M
 $f_{X,Y}(x,y) = \begin{cases} 2 - x - y ; & 0 \le x \le 1, 0 \le y \le 1 \\ \quad 0 ; & elsewhere \end{cases}$. Find the marginal probability density
 functions of X and Y.

UNIT-IV

8.a Derive the expression for the joint probability density function of two Gaussian random variables X and Y. 6M

 b Two Gaussian random variables X and Y have first and second order moments E[X] = 1; E[X^2] = 2.5, E[Y] = 1.8, E[Y^2] = 3.6 and R$_{YY}$ = 2.2. Find (a) Cov(X,Y), and (b) Correlation coefficient. 6M

(OR)

9.a Explain strict sense and wide sense stationary random process. 6M
 b State and prove properties of auto correlation function. 6M

UNIT-V

10.a Define Cross Power Spectral Density and prove any two properties. 6M
 b A stationary random process X(t) has an autocorrelation function given by $R_{XX}(\tau) = 3e^{-|\tau|} + 5e^{-4|\tau|}$. Find the power spectral density of the process. 6M

(OR)

11.a Write short notes on Noise Figure of an amplifier. 6M
 b Explain modeling of noise sources in detail. 6M

2 of 2
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AR13

PART-A

ANSWER ALL QUESTIONS   **[1 x 10 = 10 M]**

1. a) Define Contradiction.
   b) Write equivalent forms of $P \vee Q$
   c) Define Equivalence relation.
   d) What is the value of $1 + 2 + 3 + \ldots + n$.
   e) Define degree of a vertex.
   f) Define Bipartite graph.
   g) Define Poset.
   h) Define Homomorphism.
   i) Define Generating function.
   j) Define Recurrence relation.

PART-B

Answer one question from each unit   **[5x12=60M]**

UNIT-I

2. a) Construct the truth table for the statement   6 M
   $(P \leftrightarrow (Q \rightarrow R)) \Leftrightarrow (P \rightarrow (\neg Q \wedge R))$.

   b) Obtain the Principal conjunctive normal form of $(\neg P \rightarrow R) \wedge (Q \leftrightarrow P)$.   6 M

(OR)

3. a) Verify the validity of the argument   6 M
   $\neg J \rightarrow (M \vee N)$, $(H \vee G) \rightarrow \neg J$, $H \vee G$ implies $M \wedge N$.

   b) Write the following statements in symbolic form.   6 M
   i) All birds can fly   ii) Some birds can fly
   ii) No bird can fly   iv) Not all birds can fly

UNIT-II

4. a) State and Prove Euler's theorem in Number theory.   6 M
   b) Prove that the Congruence relation is an equivalence relation.   6 M

(OR)

5. a) Using Mathematical Induction prove the following   6 M

$$\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+....+\frac{1}{n(n+1)}=\frac{n}{n+1}$$

   b) Using Fermat theorem, find $3^{201} \bmod 11$.   6 M

UNIT-III

6. a) State and Prove Euler's formula in plane graphs.   6 M
   b) Find the adjacency matrix of the complete graph K_4.   6 M

(OR)

7. a) Prove that in a tree with n vertices has (n-1) edges.   6 M
   b) State BFS algorithm for a spanning tree and give an example.   6 M

UNIT-IV

8. a) Prove that , a non-empty subset S of a group (G ,*) is a subgroup of G   6 M
   if and only if for any a , b $\in$ G , $a * b^{-1} \in S$.
   b) State and Prove Lagrange's theorem.   6 M

(OR)

9. a) Define Hasse Diagram of a Poset. and draw the Hasse diagram of the   6 M
   Poset $(D_{150}, |)$ where D_{150} is the set of all divisors of 150 and | is the
   relation "divides ".
   b) Let $A = \{1,2,3,4,5,6,7,8,9,10\}$. Define a relation $R = \{(a,b)/b \text{ divides } a\}$ on   6 M
   A. Then what are the properties does R satisfy ?

UNIT-V

10. Solve the Recurrence relation $a_n - 7a_{n-1} + 12a_{n-2} = n4^n$.   12 M

(OR)

11. a) Find the Coefficient of $x^5 y^7$ in $(8x+3y)^{12}$.   6 M

    b) Calculate $B(X) = \sum_{r=0}^{\infty} b_r X^r = \dfrac{1}{X^2 - 8X + 12}$.   6 M