

# AR18

**CODE: 18CET202**

**SET-1**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI**

**(AUTONOMOUS)**

**II B.Tech I Semester Supplementary Examinations, October-2021**

**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 the difference between U-tube differential Manometer and Inverted U-tube differential Manometers? Where are they used? (6 M)  
b) Define Pascal's law and derive the equation for the Pascal's law. (6 M)  
(OR)
2. a) Pipes A and B are carrying water at a pressures of  $100 \text{ kN/m}^2$  and  $200 \text{ kN/m}^2$  respectively. Pipe B is located 3 m above pipe A. Find the deflection of mercury in mercury U-tube differential manometer when both the limbs are connected to both the pipes. (6 M)  
b) If the velocity distribution over a plate is given by  $u = \frac{2}{3} y - y^2$  in which u is the velocity in meter per second at a distance y meter above the plate. Determine the shear stress at  $y = 0.3 \text{ m}$ . Take dynamic viscosity of fluid as 10 poises. (6 M)

## UNIT-II

3. a) Write the conditions of equilibrium of floating and submerged bodies. (6 M)  
b) What is Meta centre and derive the expression for Metacentric height. (6 M)  
(OR)
4. a) Derive the location of centre of pressure from free surface of liquid of an inclined plane surface submerged in liquid. (6 M)  
b) Find the location and magnitude of hydrostatic force on an inclined circular plate of diameter 0.4 m of inclination of  $45^\circ$  with the water surface when the top of the plate is 2 m below the free water surface. (6 M)

## UNIT-III

5. a) Derive the equation of continuity in 3D-form. (6 M)  
b) The velocity potential function is given by an expression  $\phi = x^2 - y^2$ . Find the velocity components in x and y direction and show that  $\phi$  represents a possible case of flow. (6 M)

(OR)

6. a) Classify different types of flows. (6 M)  
 b) The stream function  $\Psi=8xy$ . Calculate the velocity at the point p(4,5). (6 M)  
 Also find the velocity potential function  $\phi$ .

#### UNIT-IV

7. a) Derive Euler's equation of motion? How will you obtain Bernoulli's expression from it? (6 M)  
 b) A pipe line carrying oil of specific gravity 0.8, changes in diameter from 200 mm diameter at a position A to 500 mm diameter at position B which is 5 m at a higher level. If the pressures at A and B are  $9.5 \text{ N/cm}^2$  and  $6.5 \text{ N/cm}^2$  respectively and the discharge is 150 liters/sec. determine the loss of head and direction of flow. (6 M)

(OR)

8. a) Explain characteristics of laminar and turbulent flows. (6 M)  
 b) A 300 mm diameter pipe carries water under a pressure of a  $245 \text{ kN/m}^2$  at inlet and  $235 \text{ kN/m}^2$  at outlet. If the pipe has a right angled bend, conveys a discharge of  $0.3 \text{ m}^3$  per second. Find the magnitude and direction of the resultant force at the bend. (6 M)

#### UNIT-V

9. An oil of specific gravity of 0.9 and viscosity 0.06 poise is flowing through a pipe of 200 mm diameter at a rate of 60 lit per second. Find the head lost due to friction for 500 m length pipe. (12M)

(OR)

10. a) What is a Venturimeter? Derive the expression for the discharge through a Venturimeter. (6 M)  
 b) The head of water over an orifice of diameter 100 mm is 10 m. The water coming out from orifice is collected in a circular tank of diameter 1 m. The rise of water level in this tank is 1 m in 25 seconds. Also the coordinates of a point on the jet, measured from vena-contracta are 4 m horizontal and 0.5 m vertical. Find the coefficients  $C_d$ ,  $C_c$ , and  $C_v$ . (6 M)

# AR18

**CODE: 18EET203**

**SET-1**

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

**II B.Tech I Semester Supplementary Examinations, October-2021**

**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) Calculate  $\mathbf{E}$  at  $P(1, 1, 1)$  caused by four identical 3 nC charges located at  $P_1(1, 1, 0)$ ,  $P_2(-1, 1, 0)$ ,  $P_3(-1, -1, 0)$ , and  $P_4(1, -1, 0)$ . (6M)
- b) Derive an expression for  $\mathbf{E}$  due to a sheet of charge, by applying Coulomb's law. (6M)

**(OR)**

2. a) State Gauss's law? Using Gauss's evaluate  $\mathbf{D}$  due to infinite line of charge? (6M)
- b) Given the potential field,  $V = 2x^2 y - 5z$ , and a point  $P(-4, 3, 6)$ , find the following at point  $P$ : the potential  $V$ , the electric field intensity  $\mathbf{E}$ , the direction of  $\mathbf{E}$ , the electric flux density  $\mathbf{D}$ , and the volume charge density  $\rho_v$ . (6M)

## UNIT-II

3. a) Derive the expression for the continuity equation. (6M)
- b) A dipole with  $\mathbf{p} = 0.1\mathbf{a}_z \mu\text{C}\cdot\text{m}$  is located at  $A(1, 0, 0)$  in free space, and the  $x = 0$  plane is perfectly conducting. Calculate  $V$  at  $P(2, 0, 1)$ . (6M)

**(OR)**

4. a) Derive an expressions for boundary condition between di-electric and di-electric. (8M)
- b) Two conducting plates, each  $3 \times 6$  m, and three slabs of dielectric, each  $1 \times 3 \times 6$  m, and having dielectric constants of 1, 2, and 3, are assembled into a capacitor with  $d = 3$  m. Determine the two values of capacitance obtained by the two possible methods of assembling the capacitor. (4M)

## UNIT-III

5. a) A thin linear conductor of length 'l' and carrying a current 'I' is coincident with y-axis. One end of the conductor is at  $y_1$ , and other end is at  $y_2$  from the origin. Using Biot-Savart's law, show that the magnetic flux density due to the conductor at a point on the x-axis at a distance  $x_1$  from the origin is (6M)

$$\mathbf{B} = \frac{\mu_0 I}{4\pi x_1} \left[ \frac{y_2}{\sqrt{x_1^2 + y_2^2}} - \frac{y_1}{\sqrt{x_1^2 + y_1^2}} \right]$$

- b) A steady current 'I' flows in a conductor bent in the form of a hexagon. (6M)  
Find the intensity at the center of the loop. The distance between center and each side is 'a' m.

(OR)

6. a) State and prove Ampere's circuital law. (6M)  
b) A wood ring of space section of internal diameter 0.40 m and external diameter 0.60 m carries a toroidal winding of 500 turns uniformly distributed and having current of 1 A. Calculate magnetic field of inner, outer cylindrical surface. (6M)

#### UNIT-IV

7. a) Derive the expression for the Lorentz's force equation. (6M)  
b) A rectangular loop of wire in free space joins point A(1, 0, 1) to point B(3, 0, 1) to point C(3, 0, 4) to point D(1, 0, 4) to point A. The wire carries a current of 6 mA, flowing in the  $\mathbf{a}_z$  direction from B to C. A filamentary current of 15 A flows along the entire z axis in the  $\mathbf{a}_z$  direction. (a) Find  $\mathbf{F}$  on side BC. (b) Find  $\mathbf{F}$  on side AB. (c) Find  $\mathbf{F}_{\text{total}}$  on the loop. (6M)

(OR)

8. Derive an expression for Torque on a current loop placed in a magnetic field  $\mathbf{B}$  (12M)

#### UNIT-V

9. a) Derive an expression for displacement current density. (8M)  
b) Show that the ratio of the amplitudes of the conduction current density and the displacement current density is  $\sigma/\omega\epsilon$  for the applied field  $E = E_m \cos \omega t$ . Assume  $\mu = \mu_0$ . (4M)

(OR)

10. a) Summarize Maxwell's equations in point and integral forms for time varying fields. (4M)  
b) Derive an expression for poynting theorem . (8M)

# AR18

**CODE: 18EST203**

**SET-2**

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

**II B.Tech I Semester Supplementary Examinations, October-2021**

**ENGINEERING MECHANICS  
(Common to ECE & ME)**

**Time: 3 Hours**

**Max Marks: 60**

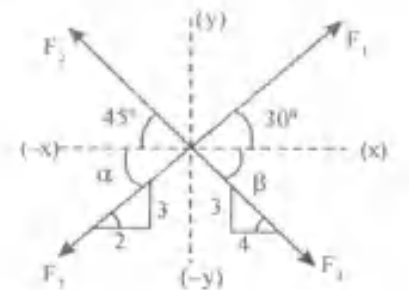
Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

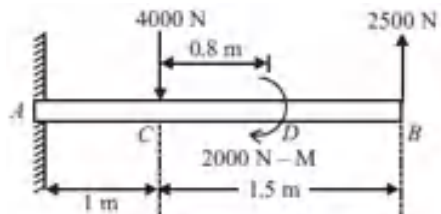
## UNIT-I

1. a) Define free body diagram and explain with suitable Examples 4M
- b) Find the magnitude and direction of the resultant  $R$  of the four 8M  
concurrent forces as shown in Figure-1. Given that  
 $F_1=1500\text{N}$ ,  $F_2=2000\text{N}$ ,  $F_3=3500\text{N}$ ,  $F_4=1000\text{N}$



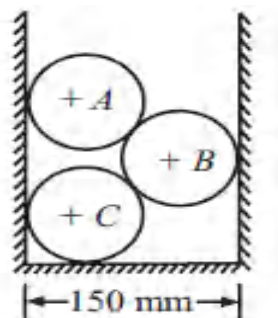
**(OR)**

2. a) Define Equilibrium and Resultant 4M
- b) Determine the resultant of the system and an equivalent 8M  
system through of a two vertical forces and a couple of  
moment  $2000\text{ Nm}$  acting on a horizontal rod, which is fixed  
at end A as shown below.



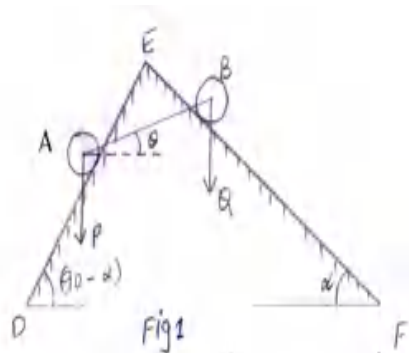
## UNIT-II

3. Three spheres  $A$ ,  $B$ ,  $C$  are placed as shown in figure. The diameter of each sphere is  $100\text{ mm}$ . Determine the reactions produced at each Contact point. Assume the weight of spheres  $A$ ,  $B$ ,  $C$  are  $1\text{ kN}$ .



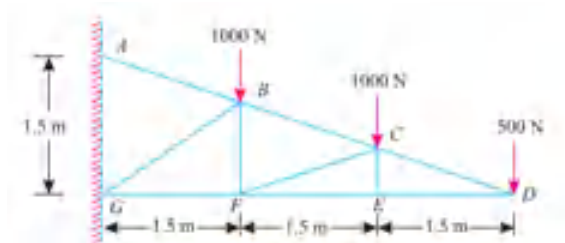
(OR)

4. Two rollers of weights  $P$  and  $Q$  are connected by a flexible string  $AB$ . The rollers rest on two mutually perpendicular planes  $DE$  and  $EF$  as in fig. Find the tension in the string and the angle that it makes with the horizontal when the system is in equilibrium. Given  $P = 50\text{ N}$ ,  $Q = 100\text{ N}$ ,  $\alpha = 30^\circ$ .



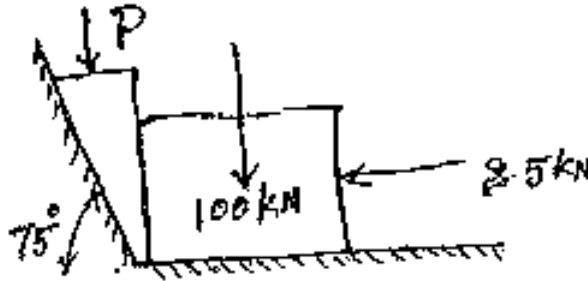
## UNIT-III

5. Figure shows a cantilever truss having a span of  $4.5$  meters. It is hinged at two joints to a wall and is loaded as shown. Find the forces in all the member of the truss



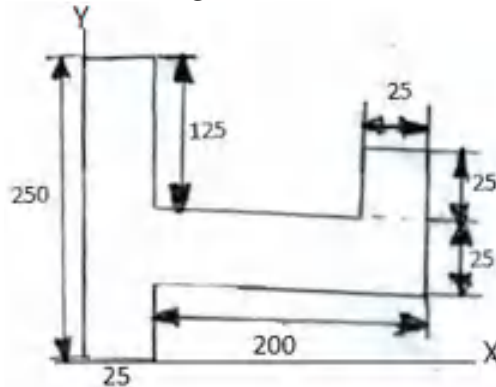
(OR)

6. Determine the force  $P$  required to start the wedge as shown in figure. The angle of friction for all surfaces of contact is  $15^\circ$ . 12M



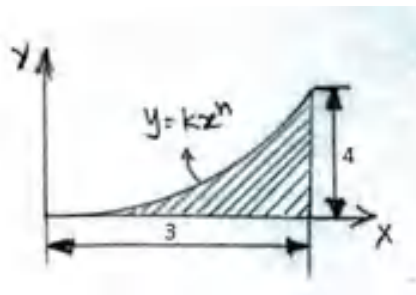
#### UNIT-IV

7. a) Define area Moment of Inertia 4M  
b) Find the area moment of inertia about X and Y axes for composite area shown in fig 8M



(OR)

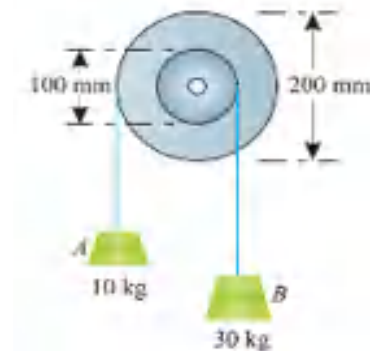
8. a) Distinguish between Centre of gravity and centroid. 4M  
b) Locate the centroid of the area under the curve  $y=kx^n$  as shown in fig 8M



#### UNIT-V

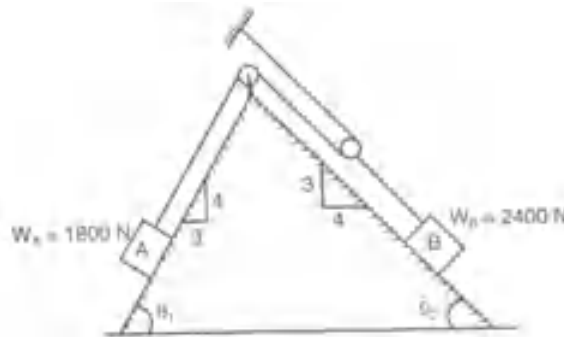
9. a) A car starts from rest on a curved road of 250m radius and accelerates at a constant tangential acceleration of  $0.6\text{m/s}^2$ . Determine the distance and the time for which that car will travel before the magnitude of the total acceleration attained by it become  $0.75\text{ m/s}^2$  4M

- b) Two bodies A and B of masses 30 kg and 10 kg are tied to the two ends of a light string passing over a composite pulley of radius of gyration as 70 mm and mass 4 kg as shown in Fig. Find the pulls in the two parts of the string and the angular acceleration of the pulley



(OR)

10. In what distance will a body A of the fig. attain a velocity of 12 m/s starting from rest? The coefficient friction for all contacting surfaces is 0.2. Pulleys are friction less and weight less



4 of 4

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# AR18

**CODE: 18CST202**

**SET-2**

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

**II B.Tech I Semester Supplementary Examinations, October-2021**

## **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) Examine whether  $[(P \vee Q) \wedge \sim(\sim P \wedge (\sim Q \vee \sim R)) \vee (\sim P \wedge \sim Q) \vee (\sim P \wedge \sim R)]$  is a tautology or not. 6
  - b) Write the negation of the following statements. 6
    - (a). If it is raining, then the game is cancelled.
    - (b). If he studies then he will pass the examination.Are  $(p \rightarrow q) \rightarrow r$  and  $p \rightarrow (q \rightarrow r)$  logically equivalent? Justify your answer by using the rules of logic to simplify both expressions
- (OR)**
2. a) Obtain the PDNF for  $(P \wedge Q) \vee (\neg P \wedge R) \vee (Q \wedge R)$  6
  - b) Write the following statements in symbolic form: 6
    - (i). Something is good (ii). Everything is good (iii). Nothing is good (iv). Something is not good

### **UNIT-II**

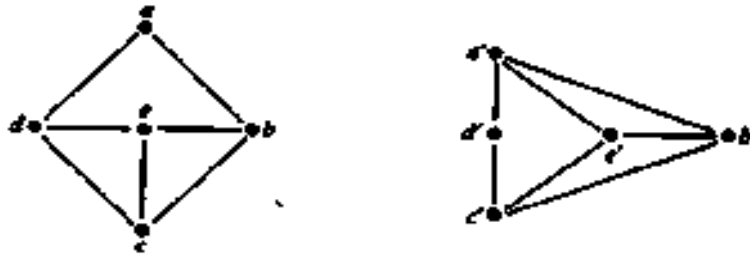
3. a) Explain the Properties of Relations with example. 6
  - b) Show that the functions  $f(x) = x^3$  and  $g(x) = x^{1/3}$  for  $x \in \mathbb{R}$  are inverses of one another 6
- (OR)**
4. a) List out the properties of Lattices . 6
  - b) Use pigeonhole principal to show that in any set of eleven integers, there are two integers whose difference is divisible by 10. 6

### **UNIT-III**

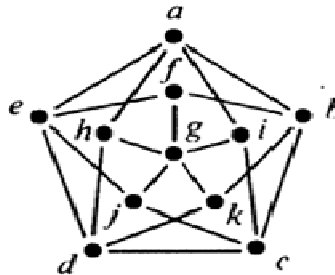
5. a) How to represent a Graph in Matrix form ? Give Examples. 6
  - b) Let  $G$  be a  $(p, q)$  graph such that all vertices have  $k$  or  $(k+1)$ . If  $G$  has  $t$  ( $t > 0$ ) vertices have degree  $k$  then show that  $t = p(k+1) - 2q$ . 6
- (OR)**
6. a) State necessary conditions for the graph to be Isomorphic. Explain with suitable Example. 6
  - b) Define Euler's path and Euler's Circuit with an example 6

## UNIT-IV

7. a) State the necessary conditions for the graphs to become Isomorphic. Identify whether the following graphs are Isomorphic or not. 6



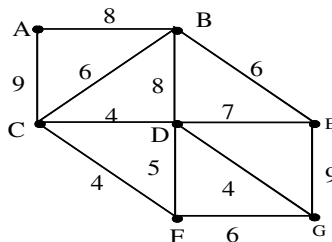
- b) 6



Construct a Spanning Tree for the above graph using DFS for the given graph

**(OR)**

8. a) Discuss about the spanning tree. Using Prim's Algorithm, determine the minimal spanning tree for the following Figure (i). Also find its minimum cost. 6



- b) Write short notes on graph coloring. 6

## UNIT-V

9. a) Solve  $a_n - 9a_{n-1} + 27a_{n-2} - 27a_{n-3} = 0$  for  $n \geq 3$  6  
 b) What is the coefficient of  $x^3y^7$  in  $(2x - 9y)^{10}$ ? 6

**(OR)**

- 10 Using generating function method solve the recurrence relation 12  
 $a_{n+1} = 3a_n + (n+1), n \geq 0$

# AR16

**CODE: 16CE2003**

**SET-1**

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

**II B.Tech I Semester Supplementary Examinations, October-2021**

**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) Enumerate viscosity. Define the units of viscosity. 7 M
- b) A plate 0.025 mm distance from a fixed plate, moves at 60 cm/sec and requires a force of 2N per unit area i.e. 2 N/Sq.mt. to maintain this speed. Determine the fluid viscosity between the plates. 7 M

**(OR)**

2. a) Enumerate the variation of pressure at a point to be measured in case of gauge pressure and vacuum pressure for u-tube manometer. 7 M
- b) State and derive Pascal's law. 7M

## **UNIT-II**

3. a) Define hydro static law and centre of pressure. 7 M
- b) Enumerate the concepts of absolute pressure, gauge pressure and atmospheric pressure. 7 M

**(OR)**

4. a) A rectangular plane surface is 2 m wide and 3 m deep. It lies in vertical plane in water. Determine the total pressure and position of centre of pressure on the plane surface when its upper edge is horizontal and (i) coincide with water surface, (ii) 2.5 m below the free water surface. 7 M
- b) A pipe line which is 4 m diameter contains a gate valve. The pressure at the centre of the pipe is  $19.6 \text{ N/cm}^2$ . If the pipe is filled with oil of specific gravity 0.87, find the force exerted by the oil upon the gate and position of centre of pressure. 7 M

## **UNIT-III**

5. a) Enumerate the types of fluid flow 7 M
- b) The stream function  $\Psi=2xy$ . Calculate the velocity at the point p(2,3). Also find the velocity potential function  $\phi$ . 7 M

**(OR)**

6. a) A 30 cm diameter pipe, conveying water, branches into two pipes of diameters 20 cm and 15 cm respectively. If the average velocity in the 30 cm diameter pipe is 2.5 m/s, find the discharge in this pipe. Also determine the velocity in 15 cm pipe if the average velocity in 20 cm diameter pipe is 2 m/s/ 7 M
- b) A fluid flow field is given by  $V = x^2yi + y^2zj - (2xyz + yz^2)k$  7 M  
 Prove that it is a case of possible steady incompressible fluid flow. Calculate the velocity and acceleration  $j$  at the point (2,1,3).

#### UNIT-IV

7. a) State Bernoulli's theorem for steady flow of an incompressible fluid. Derive an expression for Bernoulli's equation from the first principle and state the assumptions made for such a derivation. 7M
- b) What is Renold's number and explain its significance. 7M
- (OR)**
8. a) A pipe, through which water is flowing, is having diameters, 20 cm and 10 cm at the cross sections 1 and 2 respectively. The velocity of water at section 1 is given as 4.0 m/s. Find the velocity head at sections 1 and 2 and also rate of discharge. 7 M
- b) Enumerate the practical applications of Bernoulli's Equations 7 M

#### UNIT-V

9. a) Enumerate the types of losses of energy in pipes. 7 M
- b) Explain TEL and HGL in analysis of pipes. 7 M
- (OR)**
10. a) Find the discharge through a fully sub-merged orifice of width 2 m if the difference of water levels on both sides of the orifice be 50 cm. The height of water from the top and bottom of the orifice are 2.5 m and 2.75 m respectively. Take  $C_d = 0.6$ . 7 M
- b) A rectangular orifice 0.9 m wide and 1.2 m deep is discharging water from a vessel. The top edge of the orifice is 0.6 m below the water surface in the vessel. Calculate the discharge through the orifice if  $C_d = 0.6$  and percentage error if the orifice is treated as a small orifice.; 7M

# AR16

**CODE: 16CE2003**

**SET-1**

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

**II B.Tech I Semester Supplementary Examinations, October-2021**

**FLUID MECHANICS**

**(Civil Engineering)**

**Time: 3 Hours**

**Max Marks: 70**

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- b) A pipe line which is 4 m diameter contains a gate valve. The pressure at the centre of the pipe is  $19.6 \text{ N/cm}^2$ . If the pipe is filled with oil of specific gravity 0.87, find the force exerted by the oil upon the gate and position of centre of pressure. 7 M

## UNIT-III

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#### UNIT-IV

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- b) Enumerate the practical applications of Bernoulli's Equations 7 M

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9. a) Enumerate the types of losses of energy in pipes. 7 M
- b) Explain TEL and HGL in analysis of pipes. 7 M
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- b) A rectangular orifice 0.9 m wide and 1.2 m deep is discharging water from a vessel. The top edge of the orifice is 0.6 m below the water surface in the vessel. Calculate the discharge through the orifice if  $C_d = 0.6$  and percentage error if the orifice is treated as a small orifice.; 7M

# AR16

**CODE: 16ME2005**

**SET-1**

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

**II B.Tech I Semester Supplementary Examinations, October-2021**

**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 tensile test was conducted on a mild steel bar. The following data was obtained from the test:
- (i) Diameter of the steel bar = 30 mm
  - (ii) Gauge length of the bar = 200 mm
  - (iii) Load at elastic limit = 250 kN
  - (iv) Extension at a load of 150 kN = 0.21 mm
  - (v) Maximum load = 380 kN
  - (vi) Total extension = 60 mm
  - (vii) Diameter of rod at failure = 22.5 mm
- 14 M
- Determine:
- a. The Young's modulus 4M
  - b. The stress at elastic limit 4M
  - c. The percentage of elongation 3M
  - d. The percentage decrease in area. 3M

**(OR)**

2. A steel rail is 12.6m long and is laid at a temperature of  $24^{\circ}\text{C}$ . The maximum temperature expected is  $44^{\circ}\text{C}$ .
- (i) Estimate the minimum gap between two rails to be left so that thermal stress does not develop. 14M
  - (ii) Calculate the thermal stresses developed in the rails when
  - (iii) No expansion joint is provided
  - (iv) A 2mm gap is provided for expansion.
- If the stress developed is 20 MPa, what is the gap left between the rails?  
Take  $E=2 \times 10^5 \text{ N/mm}^2$  and  $\alpha = 12 \times 10^{-6}/^{\circ}\text{C}$

## UNIT-II

3. a) What is meant by principle stresses and principle planes? 4 M
- b) A rectangular block of material is subjected to a tensile stress of  $110 \text{ N/mm}^2$  on one plane and a compressive stress of  $47 \text{ N/mm}^2$  on the plane at right angle to the former. Each of the above stress is accompanied by a shear stress of  $63 \text{ N/mm}^2$  10 M
- Find (i) The direction and magnitude of each of the principal stress (ii) Magnitude of greatest shear stress.
- (OR)**
4. A simply supported beam of 10m long carries a uniformly distributed load  $2 \text{ kN/m}$  over entire length and point loads 1kN and 2kN at distances 2m and 5m from the left support. Draw the Shear force and bending moment diagrams. 14M

### **UNIT-III**

5. a) Derive bending equation and list the assumptions. 7M
- b) A T section of a beam has the following dimensions. Width of flange 100 mm, overall depth 80 mm, thickness of stem and flange 10 mm. Determine the maximum stress in the beam, when a bending moment of 200 N-m is acting on the section. 7 M

**(OR)**

6. a) Prove that the maximum shear stress for a rectangular section is 1.5 times the average shear stress. 7 M
- b) Prove that the maximum shear stress of a solid circular cross section is 1.33 times average shear stress. 7 M

### **UNIT-IV**

7. a) What are the assumptions in the theory of pure torsion 4 M
- b) 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  $1^\circ$  in a length of 3 metres. Take  $C = 80$  GPa. 10 M

**(OR)**

8. Determine the crippling load for a T- section of dimensions 100 mm X 100 mm X 20 mm and of length of 5 m when it is used as strut with both of its ends hinged. Take  $E = 2.1 \times 10^5$  N/mm<sup>2</sup> 14M

### **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-mm<sup>2</sup>. 14 M

**(OR)**

10. a) Derive relation between slope, deflection and radius of curvature. 6 M
- b) Derive deflection at the free end of a cantilever of length L and carrying uniformly distributed load w per unit run over whole length. 8 M



# AR16

**CODE: 16EC2004**

**SET-1**

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

**II B.Tech I Semester Supplementary Examinations, October-2021**

**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) Derive an expression for output of lowpass RC circuit excited by step input and draw its characteristics for different time constants 7M

- b) Explain the response of series RLC circuit for step input 7M

**(OR)**

2. a) Explain the response of High-pass RC circuit for square wave input 7M

- b) Draw the circuit diagram of compensated attenuator and explain it. 7M

**UNIT-II**

3. a) Explain clipping at two independent levels using diodes 7M

- b) Draw the circuit of transistor clipper and explain its operation 7M

**(OR)**

4. a) State and explain clamping circuit theorem 7M

- b) Give some applications of clipping and clamping circuits 7M

**UNIT-III**

5. a) Explain diode forward recovery time and reverse recovery time 7M

- b) Explain the working of self-bias bistable multi vibrator with neat diagrams. 7M

**(OR)**

6. a) Discuss the following terms pertaining to transistor switching times. i) Rise time, ii) Delay time, iii) Storage time. 7M

- b) Explain the operation of Schmitt trigger circuit 7M

# AR16

**CODE: 16EC2004**

**SET-1**

## UNIT-IV

7. a) Draw the circuit diagram of collector coupled mono stable multivibrator and explain its operation 7M  
b) What are the different methods to generate time base waveforms? Explain 7M  
(OR)
8. a) Explain how an Astable multivibrator can be used as voltage to frequency converter. 7M  
b) Explain the basic principles of Bootstrap time base generators. 7M

## UNIT-V

9. a) What is blocking oscillator? List the applications of blocking oscillator 7M  
b) Discuss about reduction of pedestal in sampling gates 7M  
(OR)
10. a) Explain about Bi-directional sampling gate. 7M  
b) Explain the operation of four diode sampling gate 7M

**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE  
(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**

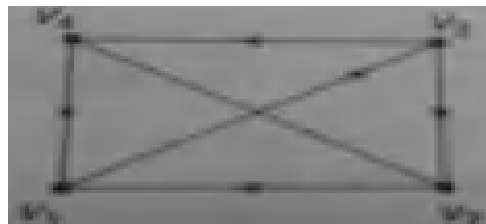
1. a) Show that  $(\neg P \wedge (\neg Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge R)$  is equivalent to  $R$  using equivalence formulae 7M
  - b) "If I get bonus and my friends are free, I'll take them to trip. If my friends do not find a job then they will be free. I got my bonus. My friends did not find job. Therefore I'll go to trip with my friends." Write the above statements in symbolic form and establish the validity of the arguments. 7M
- (OR)**
2. a) Obtain PDNF of  $(P \wedge Q) \vee (\neg P \wedge R) \vee (Q \wedge R)$ . Represent the same in  $\Sigma$  notation 7M
  - b) Find a formula for  $(1/1*2)+(1/2*3)+.....+(1/n(n+1))$  use mathematical induction to prove your result. 7M

**UNIT-II**

3. a) Define function. What are the different types of functions? Explain with examples 7M
  - b) If  $R$  is a relation on the set  $A=\{1,2,3,4,6,8,12\}$  defined by  $\{(x,y) \mid x \text{ divides } y\}$ . Prove that  $(A,R)$  is a poset 7M
- (OR)**
4. a) Define invertible function. If  $f:R \rightarrow R$  such that  $f(x) = 2x+1$  and  $g:R \rightarrow R$  such that  $g(x) = x/3$ . Verify that  $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$  7M
  - b) How many persons must be chosen in order that atleast five of them will have birthdays in the same calendar month? Explain the principle behind this. 7M

**UNIT-III**

5. a) Define the following terms and give an example of each. 7M
  - i) Complete graph
  - ii) Isomorphic graphs
  - iii) Hamiltonian graph
- b) What is Euler path and Eulerian circuit? Determine whether the graph  $G$  given below has an Euler path or Eulerian circuit 7M

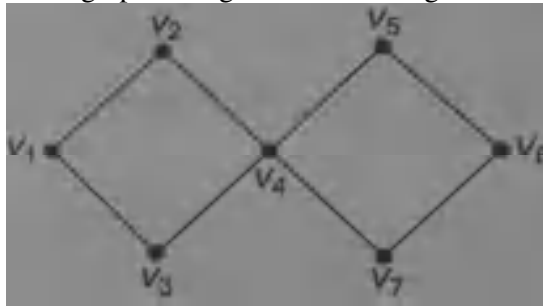


**(OR)**

6. a) When it can be said that two graphs  $G_1$  and  $G_2$  are isomorphic? How can it be discovered? Explain with example. 7M
- b) Define Planar graph. Explain how a non-planar graph can be converted to planar graph with an example 7M

**UNIT-IV**

7. a) State Krushkal's algorithm for finding Minimal Spanning Tree? Explain it with an example 7M
- b) Find a spanning tree of a graph  $G$  as given below using DFS algorithm 7M

**(OR)**

8. Write steps involved in prim's algorithm. Illustrate prim's algorithm, with your own example. 14M

**UNIT-V**

9. a) Solve the recurrence relation  $a_n = 3a_{n-1} + 2^n$ ,  $a_0 = 1$ . 7M
- b)  $a_n = 2^n + 5(3^n)$  for  $n = 0, 1, 2, \dots$ . Find  $a_0, a_1, a_2, a_3, a_4$ . Show that  $a_2 = 5a_1 - 6a_0$ ;  $a_3 = 5a_2 - 6a_1$ ;  $a_4 = 5a_3 - 6a_2$  7M

**(OR)**

10. Suppose the number of bacteria in a colony triples every hour. 14M
- Setup a recurrence relation for the number of bacteria after  $n$  hours have elapsed.
  - Find an explicit formula for the number of bacteria at the end of  $n$  hours. Verify your formula using mathematical induction
  - If 100 bacteria are used to begin a new colony, how many bacteria will be there in the colony in 10 hours

# AR13

CODE: 13EE2006

SET-2

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)

II B.Tech I Semester Supplementary Examinations, October-2021

ELECTRO MAGNETIC FIELDS  
(Electrical & Electronics Engineering)

Time: 3 Hours

Max Marks: 70

## PART-A

ANSWER ALL QUESTIONS  
M]

[1 x 10 = 10

1. a) Define Gradient.  
b) Define Coulombs law.  
c) Write Poisson's equation  
d) Define Capacitance.  
e) Define Curl.  
f) Define Amperes law.  
g) Write Lorenz Force Expression.  
h) Define Lenz's law.  
i) Define Mutual Inductance.  
j) Write Poynting Theorem.

## PART-B

Answer one question from each unit

[5x12=60M]

### UNIT-I

2. a) Find the area of a cylinder in  $a_r$  direction, where  $0 \leq \Phi \leq \pi/2$ ,  $0 \leq z \leq 10$ . 6M  
b) Find the Volume of a Sphere with  $0 \leq r \leq R$ ,  $0 \leq \theta \leq \pi/2$ ,  $0 \leq \Phi \leq 2\pi$ . 6M  
(OR)
3. a) Derive the expression for Electric Field Intensity due to infinite sheet of charge. 6M  
b) State and explain Gauss's law? Using Gauss's law find  $\mathbf{D}$  due to infinite line of charge. 6M

### UNIT-II

4. a) Derive the expression for Potential due to a Dipole. 6M  
b) Explain the behaviour of Conductors in electric field. 6M  
(OR)
5. a) Explain about boundary conditions between Conductor and Dielectric. 6M  
b) A Parallel plate capacitor has a plate area of  $1.5\text{m}^2$  and a plate separation of 5mm. There are two dielectrics in between the plates. The first dielectric has a thickness of 3mm with a relative permittivity of 6 and the second has a thickness of 2mm with a relative permittivity of 4. Find the capacitance. 6M

### **UNIT-III**

6. a) Magnetic Field intensity due to infinite sheet of current by using Amperes law. 6M  
b) State and explain Biot-Savart's law. 6M
- (OR)**
7. a) Derive the expression for H due to infinitely long straight conductor. 6M  
b) A radial field  $H = (2.39 \times 10^6 \cos \Phi)/r$  a<sub>r</sub> A/m exist in free space. Find the magnetic flux crossing the surface defined by  $0 \leq \Phi \leq \pi/4$  and  $0 \leq z \leq 1$  m. 7.42 6M

### **UNIT-IV**

8. a) Derive the expression for Torque on a current loop in a Magnetic Field. 8M  
b) Derive the expression for Force between two straight long and parallel conductors carrying currents. 4M
- (OR)**
9. a) Define magnetic Dipole, and explain about magnetic Dipole moment. 6M  
b) Write All Maxwell equations Static field. 6M

### **UNIT-V**

10. a) Derive the expression for self-inductance of a Torroid. 6M  
b) A coil of 500 turns is wound on a closed iron ring of mean radius 10cm and cross section area of 3cm<sup>2</sup>. Find the self-inductance of the winding if the relative permeability of iron is 800. 6M
- (OR)**
11. a) Explain about modified Ampers law. 6M  
b) Write All Maxwell equations for time varying field. 6M

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)****II B.Tech I Semester Supplementary Examinations, October-2021****PROBABILITY THEORY & STOCHASTIC PROCESSES  
(Electronics and Communication Engineering)****Time: 3 Hours****Max Marks: 70****PART-A****ANSWER ALL QUESTIONS****[1 x 10 = 10 M]**

1. a) What is Null Set?
- b) Define Probability through Axiom?
- c) Write the conditions for a function to be a Random variable
- d) Define the continuous random variable
- e) Write one property of correlation
- f) What is marginal distribution function
- g) Write one property of Gaussian random variable.
- h) What is non-deterministic process?
- i) The mean square value of a WSS process equals to the area under the graph of the psd: True or False
- j) Define Noise figure.

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

2. a) Discuss joint and conditional Probability. 8 M
  - b) A box contains 4 white, 2 red, and 2 black balls. If 3 balls are drawn in succession, what is the probability of getting all three balls of different colour 4 M
- (OR)**
3. a) State and explain total probability theorem 8 M
  - b) When two dice are thrown, find the probability of getting sum of 10 or 11 4 M

**UNIT-II**

4. a) What is probability density function and explain its properties 6 M
- b) A random variable X has probabilities shown below 6 M
  - I) Find the value of K
  - II) Find Probability density function

X	-3	-2	-1	0	1	2
P(x)	0.2	0.5K	K	0.1	0.3K	K

**(OR)**

5. a) Define and explain the Gaussian random variable 6 M
- b) A box contains 4 red and 2 green balls. Two balls are drawn together. Find the expected value of the number of red balls drawn. 6 M

# AR13

CODE: 13EC2005

SET-2

## UNIT-III

6. a) What is the probability distribution function of the sum of the two random variables? 6 M

b) Find the conditional density functions for the joint density function 6 M

$$f_{xy}(x, y) = 4xye^{-(x^2+y^2)} u(x)u(y)$$

(OR)

7. a) Define two joint central moments for two-dimensional random variables X and Y 6 M

b) Explain Joint Characteristic function with its properties 6 M

## UNIT-IV

8. a) Write short notes on “Jointly Gaussian random variable”. 6 M

b) For two zero Gaussian random variables X and Y show that their Joint characteristic function is 6 M

$$\Phi_{xy}(\omega_1, \omega_2) = \exp\left\{-\frac{1}{2}[\sigma_x^2\omega_1^2 + 2\rho\sigma_x\sigma_y\omega_1\omega_2 + \sigma_y^2\omega_2^2]\right\}$$

(OR)

9. a) What is cross correlation function of random process? Explain 6 M

b) For a given random process X(t), the mean value is  $\bar{X}=6$  and autocorrelation is 6 M

$$R_{xx}(\tau) = 36 + 25e^{-|\tau|}$$

Find (i) the average power of the process X(t) and (ii) Variance of X(t)

## UNIT-V

10. State and prove Wiener- Khintchin relations 12 M

(OR)

11. A wide sense stationary process X(t) is the input to a linear system whose impulse response is  $h(t) = 2e^{-7t}$ ,  $t \geq 0$ . If the auto correlation function of the process is

$$R_{xx}(\tau) = e^{-4|\tau|}$$

and the output process is Y(t), find the following

i) The PSD of Y(t)

ii) The cross spectral density  $S_{XY}(\omega)$

iii) The cross correlation function  $R_{XY}(\tau)$



**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)****II B.Tech I Semester Supplementary Examinations, October-2021  
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE  
(Common to CSE and IT)****Time: 3 Hours****Max Marks: 70****PART-A****ANSWER ALL QUESTIONS****[1 x 10 = 10 M]**

1. a) What is CNF?
- b) Construct the Truth Table for  $P \leftrightarrow Q$ .
- c) Write the properties of Well-formed formula.
- d) What is Tautology? Give an Example.
- e) What is Euler's Circuit?
- f) What is Bi-partite Graph?
- g) Give an example for Prime Factorization?
- h) Define Group?
- i) What is abelian group?
- j) Define Recurrence Relation with example.

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

2. a) Prove that  $(\neg P \wedge (\neg Q \vee R)) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$ . 6M
- b) Obtain the PDNF for  $(P \wedge Q) \vee (\neg P \wedge R) \vee (Q \wedge R)$ . 6M

**(OR)**

3. a) Show that  $S \vee R$  is tautologically implied by  $(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow S)$ . 4M
- b) Write the following statements in symbolic form 8M
  - (i). Something is good
  - (ii). Everything is good
  - (iii). Nothing is good
  - (iv). Something is not good.

**UNIT-II**

4. a) Find the gcd of 42823 and 6409 using Euclids algorithm. 6M
- b) Find  $7^{222} \bmod 11$ . 6M

**(OR)**

5. a) Find the greatest common divisors of the following pairs of integers 144 and 118. 6M  
b) Explain about Fundamental Theorem of Arithmetic. 6M

**UNIT-III**

6. a) Discuss about planar and non-planar graph with suitable example. 6M  
b) Using Prim's algorithm, find a minimal spanning tree with suitable weighted graph 6M  
(OR)  
7. a) What is Walk, Trail, Paths and circuit? Explain with suitable graphs examples. 8M  
b) How to determine adjacency matrix for a graph. Explain properties of adjacency matrix. 4M

**UNIT-IV**

8. a) Prove that  $G=(-1,1,i,-i)$  is an abelian group under multiplication. 8M  
b) Explain about properties of Monoid. 4M  
(OR)  
9. a) Show that the set  $\{1,2,3,4,5\}$  is not a group under multiplication modulo 6. 6M  
b) Show that  $(\mathbb{Z},*)$  is a group, where  $*$  is defined by  $a*b=a+b+1$ . 6M

**UNIT-V**

10. a) Solve  $a_n = 6a_{n-1} - 9a_{n-2}$  with initial conditions  $a_0=4$  and  $a_1=6$ ? 6M  
b) Solve  $a_n = 3a_{n-1} + 2^n$  with initial conditions  $a_0=27$ . 6M  
(OR)  
11. a) Solve  $a_n = a_{n-1} + n$  where  $a_0 = 2$  by substitution? 6M  
b) Solve the following recurrence relation  $a_n = 5a_{n-1} + 6a_{n-2} = 0$ ,  $n \geq 2$  by the generating function method with  $a_0 = 3$ ,  $a_1 = 3$ . 6M