Reg. No.																

Question Paper Code	14035

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Third Semester

Civil Engineering

20CEPC301– STRENGTH OF MATERIALS - I

Regulations - 2020

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	*K – Level*	*CO*
1.	A tensile test is performed on a round bar after fracture it has been found that the diameter remains approximately same at the fracture the material under test was (a)Mild steel (b)Cast iron (c) Copper (d)Aluminium	*1*	*K1*	*CO1*
2.	If a part is constrained to move and heated it will develop (a) Principal stress (b)Tensile stress (c) Compressive stress (d) Shear stress	*1*	*K1*	*CO1*
3.	An element from a strained material is subjected to 50MPa and 100MPa in two mutually perpendicular direction. Then the major principal stress is (a) 200MPa (b) 100MPa (c) 150MPa (d) 400MPa	*1*	*K1*	*CO2*
4.	The angle between the principal plane and plane of maximum shear is (a) 90 deg(b)125 deg(c)60 deg(d)None of the above	*1*	*K1*	*CO2*
5.	The strain energy of the spring when it is subjected to the greatest load which the spring can carry without suffering permanent distortion is known as (a) Limiting stress (b) Proof stress (c) Proof load stress (d) Proof resilience	*1*	*K1*	*CO3*
6.	The primary application of t-beams is to resist ____ and maintain stability. (a) Dynamic loads (b) Compressive stresses (c) Bending moments (d) Thermal stresses	*1*	*K1*	*CO3*
7.	Slope and deflection at center of simple beam carrying central point load are (a) zero and zero (b) zero and maximum (c) maximum and zero (d) minimum and maximum	*1*	*K1*	*CO4*
8.	If the length of cantilever beam carrying uniformly distributed load throughout the span is doubled, the deflection at the free end will be (a) two times(b) four times (c) eight times (d) sixteen times	*1*	*K1*	*CO4*
9.	If the diameter of a shaft subjected to torque alone is doubled, then the horse power P can be increased to (a) 16P (b) 8P (c) 4P (d) 2P	*1*	*K1*	*CO5*
10.	If a member of a truss is in compression, then what will be the direction of force that it will apply to the joints? (a) Outward (b) Inward (c) Depends on case (d) No force will be there	*1*	*K1*	*CO6*

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

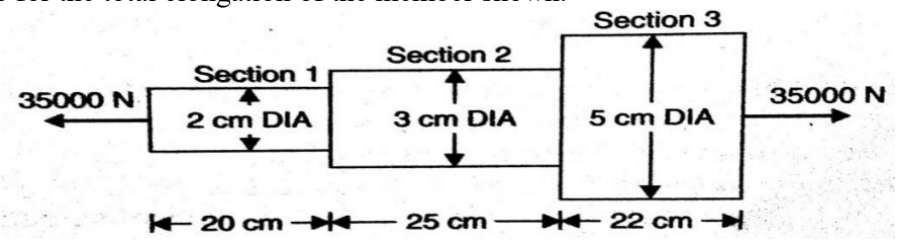
11.	Interpret the formulae for modulus of elasticity and rigidity modulus.	*2*	*K2*	*CO1*
12.	Recall Poisson's ratio.	*2*	*K1*	*CO1*
13.	Demonstrate about composite bar.	*2*	*K2*	*CO2*
14.	The modulus of elasticity(E) and modulus of rigidity(G) of a material are 200 GPa and 80 GPa respectively. Evaluate the Bulk Modulus(K).	*2*	*K2*	*CO2*
15.	Define point ofcontraflexure. In which beams it will occur.	*2*	*K1*	*CO3*
16.	Classify between hogging and sagging moment.	*2*	*K2*	*CO3*
17.	Compare between actual beam and conjugate beam.	*2*	*K2*	*CO4*

18.	Tell the formula used to find the deflection of beam by Moment-Area method.	2	K1	CO4
19.	Interpret solid shaft and hollow shaft.	2	K2	CO5
20.	Classify between closed coil helical spring and open coil helical spring.	2	K2	CO5
21.	List the advantages of method of section over method of joints.	2	K1	CO6
22.	Compare between perfect and imperfect frame.	2	K2	CO6

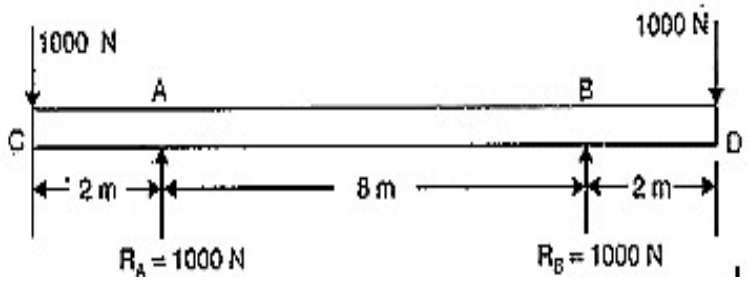
PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Three bars made of copper, zinc and aluminium are of equal length and have cross section 555, 705 and 1020 mm^2 respectively. They are rigidly connected at their ends. If this compound member is subjected to a longitudinal pull of 255kN, estimate the proportional of the load carried on each rod and the induced stresses. Take the value of E for copper = 1.3×10^5 N/mm^2, for zinc = 1×10^5 N/mm^2 and for aluminium = 0.8×10^5 N/mm^2.	11	K2	CO1
		OR			
	b)	Solve for the total elongation of the member shown.	11	K2	CO1

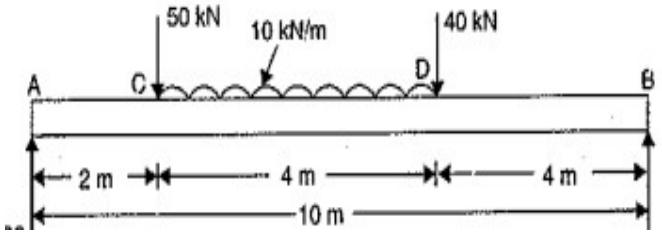


24.	a)	An element in a strained body is subjected to a compressive stress of 200Mpa and clockwise shear stress of 50Mpa on the same plane. Calculate the values of normal and shear stress on plane inclined at 35 with compressive stress. Also calculate the value of maximum shear stress in the element.	11	K2	CO2
		OR			
	b)	The principal stress at a point in a bar are 160 N/mm^2(tensile), 80N/mm^2(compressive). Determine the resultant stress in magnitude and direction on a plane 60° to axis of major principal stress. Also determine the maximum intensity of shear stress in the material at the point.	11	K2	CO2
25.	a)	Draw the SFD and BMD for the overhanging beam shown below.	11	K3	CO3

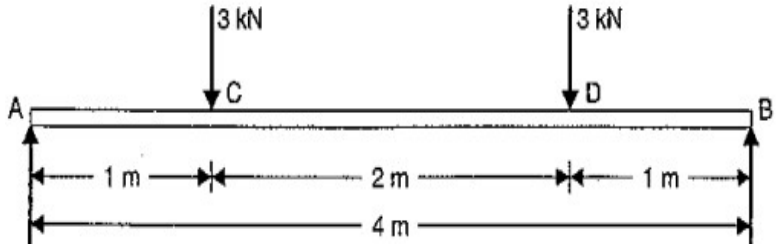


OR

b) A simply supported beam of length 10m carries the uniformly distributed load and two-point loads as shown in fig. Draw the SFD and BMD for the beam and also calculate maximum bending moment. *11 K3 CO3*

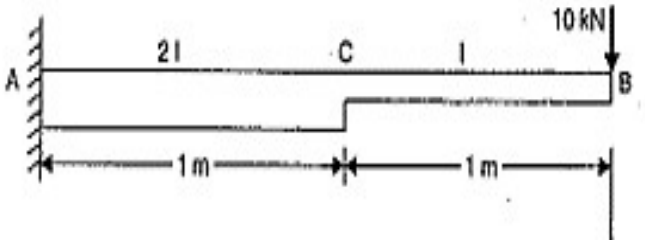


26. a) A simply supported beam of length 4 m carries a point load of 3 kN at a distance 1 m from each end. If E = 2 x 10^5 N/mm^2 and I = 10^8 mm^4 for the beam, the using conjugate beam method determine (i) slope at each end and under each load. (ii) deflection under each load. *11 K2 CO4*



OR

b) Determine the slope and deflection at the free end of cantilever given in fig. Use conjugate beam method. E = 2 x 10^5 N/mm^{2}kN/m^2, I = 10^8 mm^4. *11 K2 CO4*

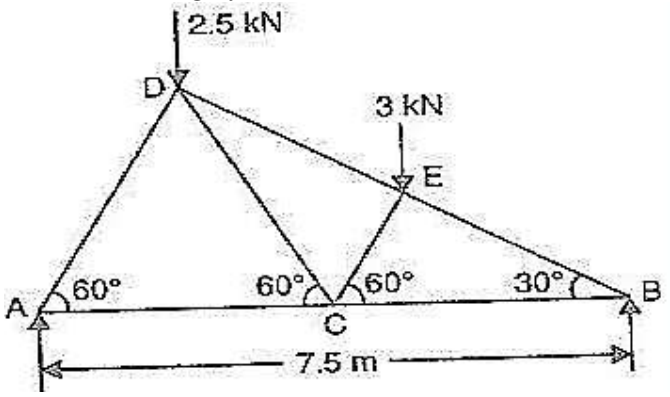


27. a) A solid circular shaft transmits 75kW power at 200rpm. Estimate the values of shaft diameter, if the twist in the shaft is not to exceed one degree in 2m length of shaft and shear stress is not exceed 50 N/mm^2. Assume the modulus of rigidity of the material of the shaft as 100 kN/mm^2. *11 K2 CO5*

OR

b) A Close-coiled helical spring of 100 mm mean diameter is made of 10 mm diameter rod and has 20 turns. The spring carries an axial load of 200 N. Determine the shearing stress. Taking the value of modulus of rigidity = 84 GN/m^2, determine the deflection when carrying this load. Also calculate the stiffness of the spring. *11 K2 CO5*

28. a) Analyse the truss shown in fig by method of Joints. *11 K2 CO6*



OR

b) Analyze truss shown in fig. and determine the forces in the members by using any one analytical method. *11 K2 CO6*