CBCS SCHEME - Make-Up Exam

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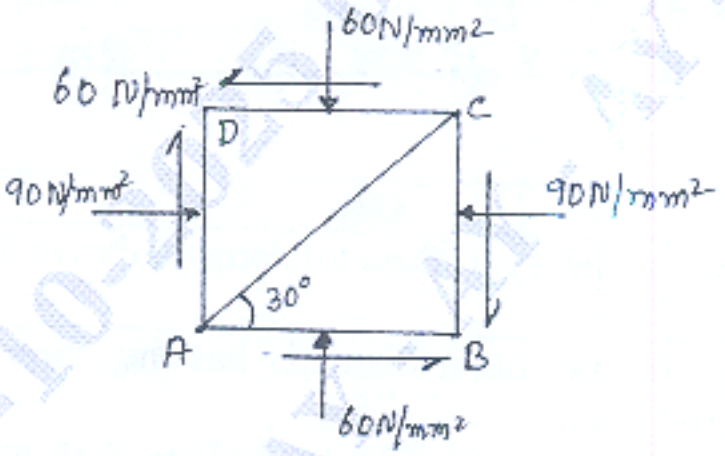
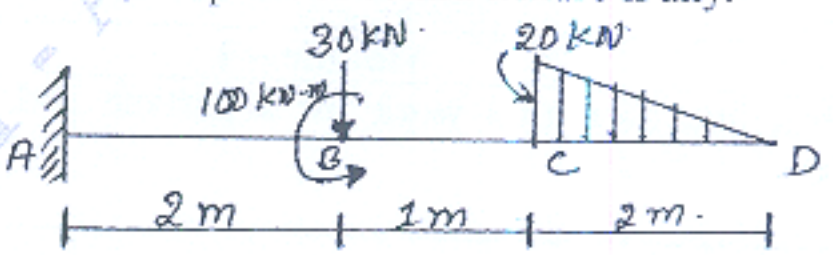
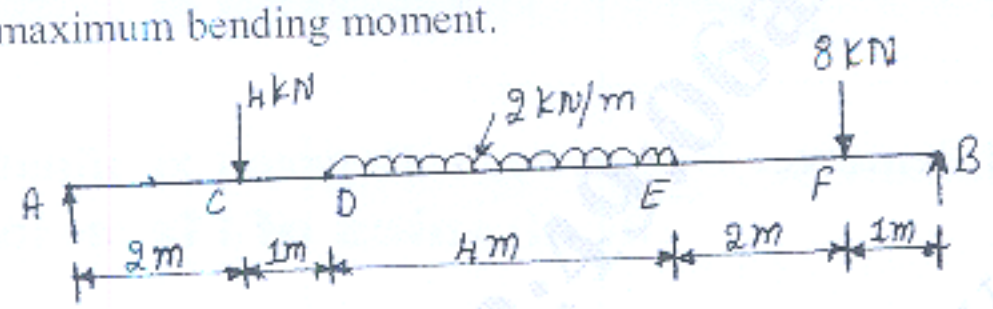
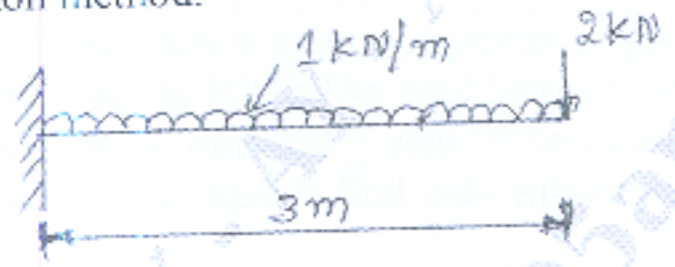
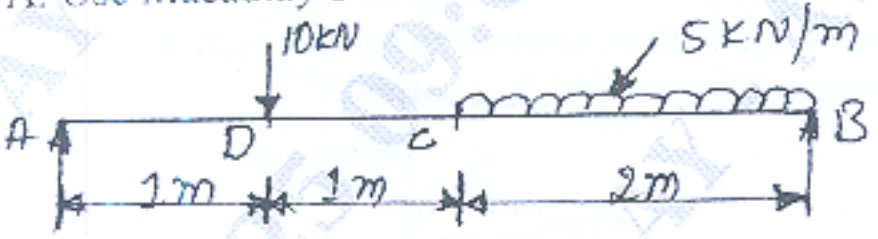
BAE304

Third Semester B.E/B.Tech. Degree Examination, June/July 2025
Mechanics of Material

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
1	a.	Derive the relation between modulus of i) Elasticity and Bulk Modulus ii) Modulus of elasticity and rigidity modulus.	10	L3	CO2
	b.	Explain stress – strain curves for brittle and ductile material, with all its salient points.	10	L2	CO2
		OR			
2	a.	A bar of 600 mm long is having a square section of size 50 mm × 50 mm. If the bar is subjected to an axial load of 120 kN and the lateral compression load of 600 kN on both faces of 50 mm × 600 mm. Find stress strains and change in size in all three directions also find change in volume. $E = 2 \times 10^5$ N/mm^2 and (1/m) = 0.3.	9	L3	CO2
	b.	A point in a machine member is subjected to stress as shown in Fig. Q2(b). Determine the following only by Mohar's circle method. i) Normal and tangential stress on plane AC ii) Principal stress and location of principal planes iii) Maximum and minimum shear stress Fig. Q2(b) 	11	L3	CO2
		Module – 2			
3	a.	Draw shear force diagram and bending moment diagram for the beam loaded as shown in Fig. 3(a). Locate the point of contra flexure if any. Fig. Q3(a) 	10	L3	CO2

	b.	Draw shear force and bending moment diagram for the beam loaded as shown in Fig. 3(b). Find maximum bending moment. Fig. Q3(b) 	10	L3	CO2
		OR			
4	a.	List Euler – Bernoulli assumptions and explain its implications.	10	L2	CO1
	b.	A beam of an I – section consists of 180 mm × 15 mm flanges and a web of 280 mm depth × 15 mm thickness. It is subjected to a bending moment of 120 KNm and a shear force of 60 kN. Sketch the bending and shear stress distributions along the depth of the section.	10	L3	CO2
		Module – 3			
5	a.	A cantilever beam is subjected to forces as shown in Fig. 5(a). Determine the slope and deflection at the free end. Take E = 2×10^8 kN/m^2 and I = 10^{-4} m^4. Use Double integration method. Fig. Q5(a) 	10	L3	CO2
	b.	A simply supported beam is loaded as shown in Fig. 5(b). Determine i) Deflection at C ii) Maximum deflection iii) Slope at end A. Use Macaulay's method. Fig. Q5(b) 	10	L3	CO2
		OR			
6	a.	List the assumptions in theory of Pure torsion and derive Torsional equation.	10	L3	CO2
	b.	A hollow shaft of 200 mm outer diameter has the same area as that of solid shaft of diameter 100 mm. i) Compare the power transmitted by the hollow shaft with that of solid shaft for the same speed. ii) Compare the angle of twist assuming same length and the material of the shaft as same.	10	L3	CO2
		Module – 4			
7	a.	Define Principle of virtual work for a particle and obtain the equilibrium equations.	10	L3	CO2

	b.	Define Complementary virtual work and differentiate between virtual work and complementary virtual work.	10	L2	CO2
		OR			
8	a.	A simply supported beam of span 'L' carries a point load 'P' at mid – span, Determine the strain energy stored in the beam. Also find the deflection at mid – span.	7	L3	CO2
	b.	A solid and hollow circular shafts of same material and same maximum stress are subjected to same maximum torque. The ratio of inner to outer diameter for the hollow shaft is 0.75. Find the ratio of strain energy stored in the two shafts.	7	L3	CO2
	c.	State the following energy theorems : i) Clapeyron's theorem ii) Castigliano's first and second theorem	6	L2	CO2
		Module – 5			
9	a.	Explain Type I , Type II and Type III fracture with neat sketch.	10	L2	CO3
	b.	Explain three stages of creep.	10	L2	CO3
		OR			
10	a.	Explain in detail the process of obtaining S – N curve by testing a specimen in Reversed bending fatigue testing machine.	10	L2	CO3
	b.	Define the following : i) Creep strength ii) Creep rupture strength iii) Stress Relaxation iv) Fatigue strength v) Endurance limit	10	L1	CO3

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