U.S.N.										

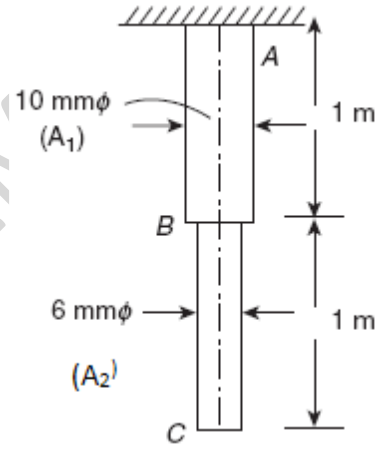
B.M.S. College of Engineering, Bengaluru-560019

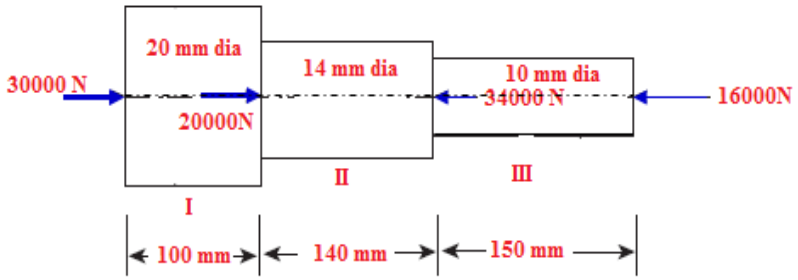
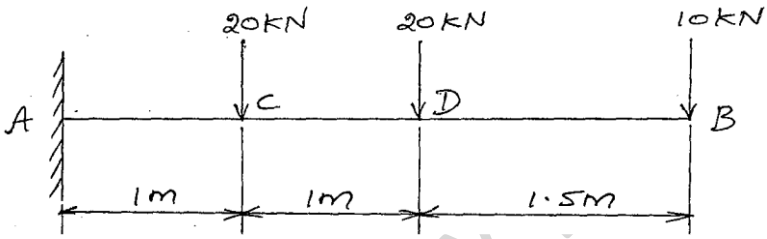
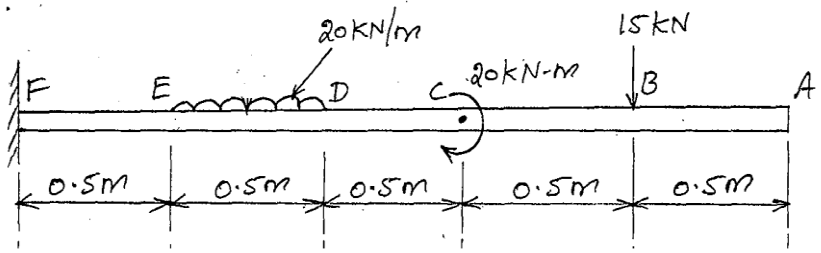
Autonomous Institute Affiliated to VTU

September / October 2024 Supplementary Examinations

Programme: B.E. **Semester: III**
Branch: Mechanical Engineering **Duration: 3 hrs.**
Course Code: 19ME3DCSOM **Max Marks: 100**
Course: Strength of Materials

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

		UNIT - I	CO	PO	Marks
1	a)	Explain : i) stress ii) strain iii) modulus of elasticity iv) Hooke's Law v) Poisson's ratio	*CO1*	*PO1* *PO2*	**10**
	b)	A stepped steel bar is suspended vertically. The diameter in the upper half is 10 mm, while the diameter in the lower half is 6 mm. What are the stresses due to self-weight in sections B and A as shown in the Figure Q1b. E = 200 kN/mm^2. Weight density, ρ = 0.7644x10^{-3} N/mm^3. What is the change in its length if E = 200000 MPa?  Figure Q1b	*CO1*	*PO1* *PO2* *PO3*	**10**
		OR			
2	a)	Determine the overall change in length of the bar shown in the Figure Q2a below with following data: E = 100000 N/mm^2.	*CO1*	*PO1* *PO2* *PO3*	**10**

			 Figure Q2a			
	b)	Derive the expression for elongation in bar due to self-weight.	*CO1*	*PO1* *PO2*	**10**
		UNIT - II			
3	a)	Draw shear force and bending moment diagrams for the beam loaded as shown in Figure Q3a.  Figure Q3a	*CO2*	*PO1* *PO2* *PO3*	**10**
	b)	A cantilever is subjected to a combination of loads shown in Figure Q3b. Draw SFD and BMD for the same.  Figure Q3b	*CO2*	*PO1* *PO2* *PO3*	**10**
		UNIT - III			
4	a)	What are the assumptions made in theory of simple bending? Derive the expression for bending equation.	*CO2*	*PO1* *PO2*	**12**
	b)	A simply supported beam of span 5 m has a cross-section 150 mm*250 mm If the permissible stress is 10 N/mm^2 find (a) maximum intensity of uniformly distributed load it can carry. (b) Maximum concentrated load P applied at 2 m from one end it can carry.	*CO2*	*PO1* *PO2* *PO3*	**08**
		OR			
5	a)	Derive the deflection equation in the form $EI\ (d^2y/dx^2)=M$.	*CO2*	*PO1* *PO2*	**10**

		b)	A simply supported beam of 6 m span is subjected to a concentrated load of 18 kN at 4 m from left support. Calculate:- i) The position & value of maximum deflection. ii) Deflection at the load point, and iii) Slope at mid-span. Take E=200 GPa, I=15x10^6 mm^4	*CO2*	*PO1* *PO2* *PO3*	**10**
			UNIT - IV			
	6	a)	State the assumptions made in pure torsion. Derive torsion equation and thus derive expression for maximum stress in a solid shaft.	*CO3*	*PO1* *PO2*	**10**
		b)	A shaft is required to transmit 245 kW power at 240 rpm. The maximum torque may be 1.5 times the mean torque. The shear stress in the shaft should not exceed 40 N/mm² and the twist 1º per metre length. Determine the diameter required if (a) The shaft is solid. (b) The shaft is hollow with external diameter twice the internal diameter. Take modulus of rigidity = 80 kN/mm².	*CO3*	*PO1* *PO2* *PO3*	**10**
			UNIT - V			
	7	a)	Derive the expressions for hoop stress and longitudinal stress developed in thin cylinders.	*CO4*	*PO1* *PO2*	**12**
		b)	A thick cylinder of internal diameter 160 mm is subjected to an internal pressure of 40 N/mm^2.If the allowable stress in the material is 120 N/mm^2.Find the thickness required.	*CO4*	*PO1* *PO2* *PO3*	**08**

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