U.S.N.										

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

Autonomous Institute Affiliated to VTU

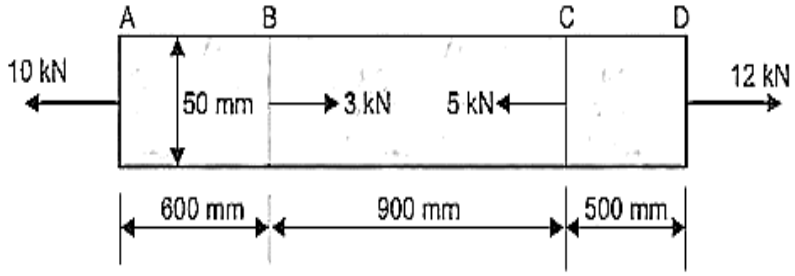
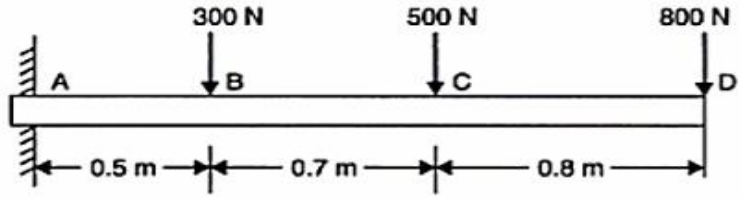
January / February 2025 Semester End Main Examinations

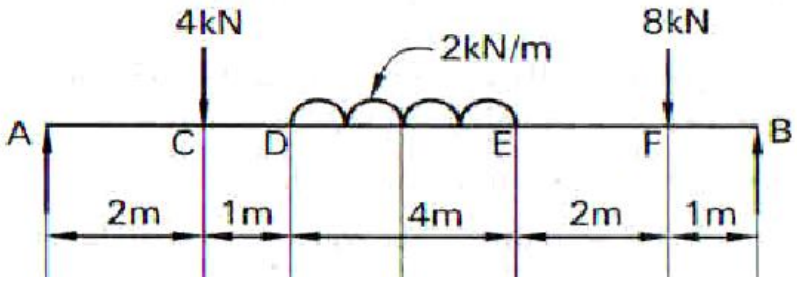
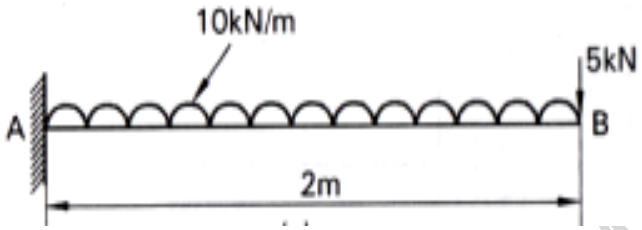
Programme: B.E. **Semester: III**
Branch: Industrial Engineering and Management **Duration: 3 hrs.**
Course Code: 22IM3PCMAM **Max Marks: 100**
Course: Materials and Mechanics

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

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Define Solid solution. With neat sketches explain different types of solid solutions.	*CO5*	*PO3*	**06**
	b)	With neat diagrams explain cooling curves for **i)** Pure metal ii) Eutectic alloy	*CO5*	*PO3*	**06**
	c)	Draw Iron- Carbon phase diagram and label all the temperature and composition fields.	*CO5*	*PO3*	**08**
		OR			
2	a)	Illustrate & explain about the schematic TTT diagram for eutectoid plain carbon steel.	*CO5*	*PO3*	**10**
	b)	Discuss Gibb's phase rule and Lever rule.	*CO5*	*PO3*	**10**
		UNIT – II			
3	a)	Compare between normalizing and annealing process.	*CO5*	*PO3*	**06**
	b)	Discuss about the purpose of heat treatment & explain the temperature region on the Iron-carbon phase diagram.	*CO5*	*PO3*	**14**
		OR			
4	a)	Discuss about Nanotechnology Applications in Nano Industries advantages & disadvantages.	*CO 5*	*PO3*	**08**
	b)	Give the classification of composite material based on reinforcing & matrix material.	*CO 5*	*PO3*	**06**
	c)	Discuss about the materials & applications of MMC.	*CO 5*	*PO3*	**06**

			UNIT - III			
	5	a)	Figure shows the bar AB of uniform cross-sectional area is acted upon by several forces. Find the deformation of the bar, assuming E = 2 x 105 N/mm2.  	*CO 2*	*PO1*	**10**
		b)	The following observations were made during a tensile test on a mild steel specimen of 40 mm diameter and 200 mm long: Elongation with 40,000 N load (within the limit of proportionality) = 0.0304 mm, Yield load = 165,000 N, Maximum load = 245,000 N, Length of the specimen at fracture = 252 mm, Determine the yield stress, the modulus of elasticity, the ultimate stress and the percentage elongation.	*CO 2*	*PO1*	**10**
			OR			
	6	a)	Show the relationship between Modulus of rigidity, Bulk modulus & Young's modulus.	*CO3*	*PO2*	**10**
		b)	Obtain an expression for change in length of a uniformly tapered circular cross section.	*CO1*	-	**10**
			UNIT - IV			
	7	a)	A cantilever beam of length 2 m carries the point loads as shown in Fig. Draw the shear force and B.M. diagrams for the cantilever beam.  	*CO4*	*PO3*	**10**
		b)	What is a beam? Explain the different types of beams with figures.	*CO3*	*PO2*	**10**
			OR			

	8	a)	Draw the shear force and bending moment diagram for the simply supported beam shown in the figure below.  	*CO4*	*PO3*	**10**
		b)	Draw the shear force and bending moment diagram for the cantilever beam shown in the figure below.  	*CO4*	*PO3*	**10**
			UNIT - V			
	9	a)	A beam of an "I" section 200 mm x 300 mm has web thickness 10 mm & flange thickness 10 mm. It carries a shearing force of 10 kN at a section. Sketch the shear stress distribution across the section.	*CO4*	*PO3*	**10**
		b)	Derive the bending equation.	*CO3*	*PO1*	**10**
			OR			
	10	a)	A cantilever of square section 200 mm x 200 mm, 2-meter-long just fails in flexure when a load of 12 kN is placed at its force end. A beam of same material and having a rectangular cross-section 150 mm wide and 300 mm deep is simply supported over a span of 3m. Calculate the minimum central concentrated load required to break the beam.	*CO4*	*PO3*	**10**
		b)	A rolled I section of size 50 mm x75 mm is used as a beam, with an effective span of 3 meters. The flanges are 5 mm thick and web is 3.75 mm thick. Calculate the uniformly distributed load the beam can carry if the maximum intensity of shear stress induced is limited to 40 MPa.	*CO4*	*PO3*	**10**

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