U.S.N.										

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

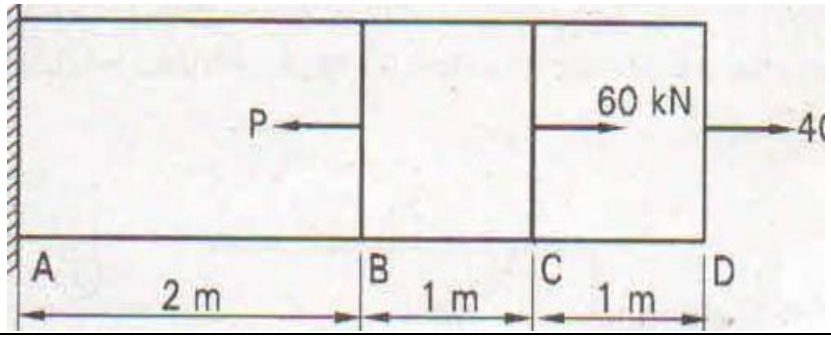
Autonomous Institute Affiliated to VTU

April 2024 Semester End Main Examinations

Programme: B.E. **Semester: III**
Branch: Industrial Engineering and Management **Duration: 3 hrs.**
Course Code: 19IM3DCMOM **Max Marks: 100**
Course: Mechanics 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.

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 stress and strain. Write the stress strain curve for mild steel specimen under tensile load and explain all the salient features	*CO*2	*PO1*	**10**
	b)	The following data pertains to a tension test conducted in laboratory Diameter of specimen = 25mm Gauge length of specimen =200mm Extension under load of 20kN = 0.04mm Load at yield point = 150kN Maximum load = 225kN Breaking load or load at failure = 120kN Length of specimen after failure =275mm Neck diameter =18.25mm Determine i) Young's modulus ii) Yield stress iii) Ultimate stress iv) Breaking Stress v) True breaking stress vi) Percentage elongation vii) Percentage reduction in area viii) Safe stress adopting a factor of safety of 2.5	*CO*2	*PO1*	**10**
		OR			
2	a)	Determine the magnitude of the load P necessary to produce zero net change in the length of the straight bar shown in fig. below. Take A=400mm^2 	*CO*3	*PO2*	**10**

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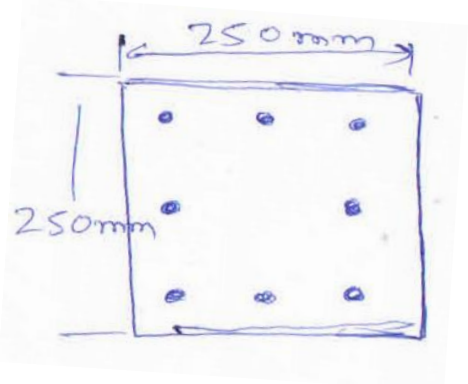
		b)	A reinforced short concrete column 250mmX 250 mm in section is reinforced with 8 steel bars. The total area of the steel bars is 1608.5mm^2. The column carries a load of 270kN. If the modular ratio is 18, find the stress in concrete and steel. If the stress in concrete shall not exceed 4N/mm^2, find the area of steel required so that the column may support a load of 400kN. 	***CO***1	-	**10**
			UNIT-II			
	3	a)	Explain the sign conventions For Shear Force, Bending Moment diagrams.	***CO***4	***PO3***	**10**
		b)	A simply supported beam of 6m long is subjected to a load of 2kN, 5kN and 4kN at a distance 1.5m, 3m and 4.5m from the left support. Draw the SFD and BMD	***CO***3	***PO2***	**10**
			UNIT - III			
	4	a)	With assumptions in pure bending derive a relationship between bending stress and radius of curvature.	***CO***4	***PO3***	**10**
		b)	A beam of symmetrical section and 200mm deep is simply supported over a span of 4 meters. Find i) Udl it may carry if the maximum bending stress not to exceed 100N/mm^2. Ii) Maximum bending stress if the beam carries a central load of 40kN. Take I=10x10^6 mm^4.	***CO***3	***PO1***	**10**
			UNIT - IV			
	5	a)	Define Solid Solution. Discuss the conditions which favor the formation of solid solution	***CO***5	***PO3***	**08**

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		b)	Construct a phase diagram to the scale on a graph sheet for the following data: Melting point of Ag: 961°C Melting point of Cu: 1083°C Eutectic temperature: 780°C Eutectic Composition: 28%Cu Maximum solubility of Cu in Ag: 9% at 780°C Maximum solubility of Ag in Cu: 8% at 780°C Maximum solubility of Cu in Ag: 2% at 400°C Maximum solubility of Ag in Cu: 0% at 400°C Label all the fields. Determine the following from the phase diagram a) Temperature at which solidification starts and ends for 20%Cu. b) Amount of eutectic in a 20%Cu-80%Ag alloy at 700°C. c) Percentage and composition of the liquid and solid phases in a 20%Ag-80%Cu alloy at 900°C Draw the cooling path of the alloy undergoing invariant reaction	***CO***5	***PO3***	**12**
			OR			
	6	a)	Draw Iron-Iron Carbon Equilibrium diagram and label all phase fields. Explain any three invariant reactions in the diagram. Draw the microstructure of 3%carbon steel at different regions.	***CO***5	***PO3***	**12**
		b)	Explain Tempering and Carburizing processes with diagrams	***CO***5	***PO3***	**08**
			UNIT - V			
	7	a)	Define Composite materials. Discuss advantages and disadvantages.	***CO***5	***PO3***	**08**
		b)	Explain Particulate and Flake composites.	***CO***5	***PO3***	**06**
		c)	Explain the bottom up and Top down process of manufacturing Nano materials	***CO***5	***PO3***	**06**

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