U.S.N.										

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

Autonomous Institute Affiliated to VTU

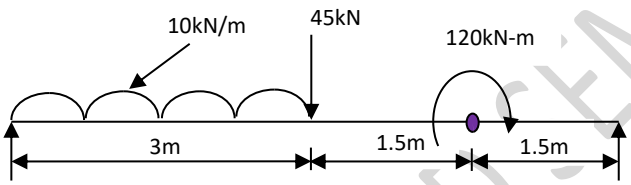
April 2024 Semester End Main Examinations

Programme: B.E. **Semester: III**
Branch: Industrial Engineering and Management **Duration: 3 hrs.**
Course Code: 23IM3PCEMM **Max Marks: 100**
Course: Engineering 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)	What is a solid solution? Explain with neat sketches the substitutional and the interstitial solid solutions.	*CO1*	-	**10**
	b)	Draw Iron – Iron Carbide phase diagram and indicate all the phases, compositions, temperatures on it. Also list the invariant reactions involved in it.	*CO1*	-	**10**
		UNIT - II			
2	a)	Classify various Heat Treatment processes. Also Compare Annealing and Normalizing with graph.	*CO2*	*PO2*	**10**
	b)	What is the concept of Metallography? What is its purpose? Identify and explain the general steps for metallographic examination.	*CO2*	*PO2*	**10**
		OR			
3	a)	What are the advantages and limitations of composite materials over conventional materials? Also list their important applications.	*CO2*	*PO2*	**10**
	b)	Give an overview of synthesis of Nanomaterials. Elaborate on Sol-Gel process of manufacturing method.	*CO2*	*PO2*	**10**
		UNIT - III			
4	a)	Define elasticity. Obtain an expression for total elongation of a uniformly tapering circular bar when it is subjected to an axial load P.	*CO3*	*PO3*	**10**
	b)	A steel bar of 50 mm wide, 12mm thick and 300 mm long is subjected to an axial pull of 84 KN. Find changes in length, width, thickness and volume of bar. Take $E=2x10^5$ N/mm^2, Poisson's ratio=0.32	*CO3*	*PO3*	**10**

			OR			
	5	a)	Draw stress-strain curve for Ductile Material and label the parts. Differentiate between: i) Resilience and Toughness ii) True Stress and Nominal Stress	*CO3*	*PO3*	**10**
		b)	load of 2 MN is applied on a short concrete column 500 mm × 500 mm. The column is reinforced with four steel bars of 10 mm diameter, one in each corner. Find the stresses in the concrete column and steel bar. Take $E_{st} = 2.1x10^5$ N/mm^2 and $E_{con} = 1.4x10^4$ N/mm^2	*CO3*	*PO3*	**10**
			UNIT - IV			
	6	a)	For the beam shown in Fig.6(a), draw SFD and BMD. Also find point of contraflexure if any.  Fig.6(a).	*CO4*	*PO4*	**14**
		b)	Define: SF, BM and Point of contraflexure	*CO4*	*PO4*	**06**
			UNIT - V			
	7	a)	Derive relationship between bending moment, bending stress and radius of curvature with usual notations. State the assumptions made.	*CO5*	*PO3*	**10**
		b)	A hollow shaft is to transmit 300kW at 80rpm. If shear stress is not to exceed 60 N/mm^2 and internal diameter is 0.6 of the external diameter, find external and internal diameters assuming maximum torque is 1.4 times the mean torque.	*CO5*	*PO3*	**10**

****