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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: Mechanical Engineering **Duration: 3 hrs.**

Course Code: 19ME3DCMSM **Max Marks: 100**

Course: Materials Science and Metallurgy

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)	With a neat sketch of stress-strain diagram explain the following, Young's modulus, modulus of rigidity, Poisson's ratio, An elasticity and Yield strength.	*CO1*	*PO1*	**10**
	b)	With neat sketches explain Fick's laws of diffusion.	*CO1*	*PO1*	**10**
		OR			
2	a)	Explain ductile and brittle fracture with relevant sketches	*CO1*	*PO1*	**10**
	b)	With neat diagrams explain a creep and fatigue curve.	*CO1*	*PO1*	**10**
		UNIT - II			
3	a)	Draw a neat eutectic phase diagram and explain the same.	*CO2*	*PO1*	**10**
	b)	Two metals A and B have their melting points at 900°C and 800°C respectively. The alloy pair forms a eutectic at 600°C of composition 60%B. They have unlimited liquid solubilities. The solid solubility of A in B is 10% and that of B in A is 5% at eutectic temperature and reduces to 0% at room temperature. Draw and label all fields. Find (i) the liquid and solid phase percentages of 20% B alloy at 650°C. ii) What is the composition of 20% B alloy at 50°C.	*CO2*	*PO1*	**10**
		OR			
4	a)	Explain Hume Rothery rules for the formation of solid solutions with example.	*CO2*	*PO1*	**10**
	b)	With the help of a neat sketch, explain an isomorphous phase diagram	*CO2*	*PO1*	**10**

			UNIT - III			
	5	a)	With the help of a neat sketch, explain iron-iron carbide phase diagram and the invariant reactions in it.	*CO2*	*PO1*	**10**
		b)	Explain with a neat figure, the continuous cooling curves on TTT diagram	*CO3*	*PO1*	**10**
			OR			
	6	a)	With neat sketch, explain the procedure for construction of TTT diagram	*CO3*	*PO1*	**10**
		b)	List the alloying elements used in steels and state their effects on steel.	*CO2*	*PO1*	**10**
			UNIT - IV			
	7	a)	Explain in detail the annealing, normalizing, and hardening heat treatment processes.	*CO4*	*PO1*	**10**
		b)	Explain the types of cast irons.	*CO4*	*PO1*	**10**
			OR			
	8	a)	Explain in brief properties of polymers and ceramics.	*CO4*	*PO1*	**10**
		b)	Explain heat treatment process for non ferrous materials.	*CO4*	*PO1*	**10**
			UNIT - V			
	9	a)	Define composite materials. Give their classification and state the advantages and disadvantages of composite materials.	*CO1*	*PO1*	**10**
		b)	Explain with sketch pultrusion and filament winding process for composites manufacturing.	*CO1*	*PO1*	**10**
			OR			
	10	a)	Explain with neat sketch powder metallurgy and stir casting process	*CO1*	*PO1*	**10**
		b)	Explain with sketch hand lay up and vacuum bag molding processes for composites manufacturing.	*CO1*	*PO1*	**10**

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