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

Course Code: 23ME3ESMSM / 22ME3ESMSM **Max Marks: 100**

Course: Material 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 explain the stress-strain diagram for Mild steel. Identify the salient points and mention the properties.	*CO1*	*PO1*	**10**
	b)	With relevant sketches explain the ductile fracture behaviour.	*CO1*	*PO1*	**10**
		OR			
2	a)	Differentiate between slip and twinning plastic deformation mechanisms. Derive the equation to evaluate critically resolve shear stress.	*CO1*	*PO1*	**10**
	b)	Sketch and explain the creep curve and identify the salient points. Elaborate on the factors that affect the creep behavior.	*CO1*	*PO1*	**10**
		UNIT - II			
3	a)	In alloys, explain the solidification mechanism with relevant sketches.	*CO1*	*PO1*	**10**
	b)	Explain the different types of solid solutions. Explain the Hume-Rothery rules governing the formation of solid solution and intermediary phases.	*CO1*	*PO1*	**10**
		OR			
4	a)	In pure metals, explain the solidification mechanism with relevant sketches.	*CO1*	*PO1*	**10**
	b)	With a neat sketch explain the isomorphous diagram considering an example and explain the Gibb's rule and Lever rule.	*CO2*	*PO1*	**10**
		UNIT - III			
5	a)	Sketch the Fe-C equilibrium diagram, identify and explain the eutectic, eutectoid and peritectic reactions.	*CO3*	*PO1* *PO2*	**10**

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		b)	Sketch and explain the continuous cooling curve for steels	*CO2*	*PO1*	**10**
			OR			
	6	a)	Sketch and explain the TTT curve for eutectoid steels.	*CO2*	*PO1*	**10**
		b)	Explain the effect of various alloying elements on steels.	*CO3*	*PO1*	**10**
			UNIT - IV			
	7	a)	Explain the mechanism of diffusion and Fick's laws of diffusion.	*CO1* *CO2*	*PO1*	**10**
		b)	Explain the surface hardening processes of carburizing and induction hardening.	*CO4*	*PO1*	**10**
			OR			
	8	a)	Explain the various factors affecting diffusion.	*CO1* *CO2*	*PO1*	**10**
		b)	Explain the heat treatment processes of annealing and tempering with relevant sketches.	*CO4*	*PO1*	**10**
			UNIT - V			
	9	a)	Explain the composition, properties and applications of low and high carbon steels.	*CO3*	*PO1*	**10**
		b)	Explain the process of pultrusion with a neat sketch.	*CO1*	*PO1*	**10**
			OR			
	10	a)	Explain the composition, properties and applications of cast iron.	*CO3*	*PO1*	**10**
		b)	Explain the process of vacuum- bag with a neat sketch.	*CO1*	*PO1*	**10**

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