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: Mechanical Engineering **Duration: 3 hrs.**
Course Code: 23ME3ESMSM / 22ME3PCMSM **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)		Considering the basic fault in a material, throw some light on point imperfections along with its types.	*CO1*	*PO1*	**08**
	b)		How does a material fail by slip and twinning? Explain with neat sketches.	*CO1*	*PO1*	**06**
	c)		The yield strength of a material is affected by over-strain. Comment on this with a sketch.	*CO1*	*PO1*	**06**
			OR			
2	a)		With a sketch explain briefly the three stages of creep.	*CO1*	*PO1*	**06**
	b)		Write a detailed note on ductile and brittle fracture with sketches.	*CO1*	*PO1*	**08**
	c)		Explain in detail any two mechanisms of material failure by fatigue	*CO1*	*PO1*	**06**
			UNIT - II			
3	a)		Define a solid solution. With it's classifications, State Hume-Rothery rules for formation of solid solutions	*CO1*	*PO1*	**10**
	b)		The nucleation process is mainly affected by surface energy and Volume energy. Considering these two energies and their responses, explain critical radius of nucleation.	*CO1*	*PO1*	**10**
			OR			
4	a)		Two metals A and B are used to form an alloy containing 75%A and 25% B. A melt at 600 °c and B at 400 °c. The solid solubility of metal A in B and of B in A are negligible. The metal pair forms a eutectic at 40%A and 60% B which solidifies at 250 ° c. Assume the liquidus and solidus line to be straight. Draw the phase diagram for the alloy series and find; i) The temperatures at which the alloy starts and completes solidification. ii) The percentage of eutectic in the alloy at room temperature.	*CO2*	*PO1*	**14**

			iii) The amount of liquid present and its composition, at a temperature of 300 ° c. iv) Specific gravity of the alloy, if specific gravity of metal A is 2.0 and metal B is 7.0.			
		b)	Draw and explain the isomorphous phase diagram.	*CO2*	*PO1*	**06**
			UNIT - III			
	5	a)	Draw Iron-Carbon equilibrium diagram with all phase fields with temperatures, corresponding microstructures. Explain all the invariant reactions.	*CO2*	*PO1*	**14**
		b)	"TTT diagram is more useful when compared to equilibrium Fe-C system". Justify.	*CO2*	*PO1*	**06**
			UNIT - IV			
	6	a)	What is heat treatment? Give the general objectives of the same.	*CO3*	*PO1*	**06**
		b)	Explain with the aid of sketch Carburizing and Flame hardening.	*CO3*	*PO1*	**08**
		c)	What are the factors affecting diffusion, explain any two of them.	*CO3*	*PO1*	**06**
			UNIT - V			
	7	a)	Define composite material. Give the classification based on matrix, geometry of reinforcement and construction.	*CO3*	*PO1*	**08**
		b)	Explain stir casting method to produce Metal Matrix Composites with a neat sketch.	*CO3*	*PO1*	**06**
		c)	With a neat sketch explain pultrusion process for FRP manufacturing.	*CO3*	*PO1*	**06**

****