

Model Question Paper-1 with effect from 2019-20 (CBCS Scheme)

USN

--	--	--	--	--	--	--	--	--	--

Fourth Semester B.E. Degree Examination Material Science and Metallurgy

TIME: 03 Hours

Max. Marks: 100

Note: Answer any **FIVE** full questions, choosing at least **ONE** full question from each **MODULE**.

Module -1			*Bloom's Taxonomy Level	Marks
Q.01	a	Classify in detail the different types of crystal imperfections	L4	10
	b	With neat sketches explain the following crystal structures: 1)body centered cubic (BCC) 2)face centered cubic (FCC)3)hexagonal close packed (HCP)	L2	6
	c	The diffusivity of copper atoms in FCC copper lattice is 8.0×10^{-21} m ² /second at 400°C and 6.0×10^{-15} m ² /second at 800°C. Calculate the activation energy in j/mole for diffusion of copper atoms in FCC copper lattice. Consider R=8.314 J/mole.	L6	4
OR				
Q.02	a	Differentiate between line dislocation and screw dislocation.	L4	8
	b	Define atomic packing factor and calculate atomic packing factor for FCC crystal structure.	L1, L5	8
	c	Illustrate steady state and non-steady state diffusion.	L2	4
Module-2				
Q. 03	a	Explain with a neat stress strain diagram the behavior of ductile metal under static tension till fracture.	L5	6
	b	Derive an expression for the critical resolved shear stress for slip in a single crystal.	L5	8
	c	Explain plastic deformation by twinning with neat sketch.	L2	6
OR				
Q.04	a	Draw S-N curve for steels showing the fatigue limit and explain briefly.	L2	8
	b	Differentiate between ductile fracture and brittle fracture	L4	6
	c	Explain the different stages of creep with the help of creep curve.	L5	6
Module-3				
Q. 05	a	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 an A is 5% at eutectic temperature and remains constant till 0°C. Draw the phase diagram and label all the fields. Find the amount of liquid and solid phases in an alloy of 20% B at 650°C.	L6	10
	b	Draw the iron-carbon equilibrium diagram and explain all the phases in the diagram.	L5	10
OR				
Q. 06	a	What is a solid solution? Mention the types of solid solution.	L1,L4	10
	b	What are cooling curves? Explain the construction of T-T-T diagram with a neat labeled figure.	L4	10
Module-4				
Q. 07	a	Write notes on the following:	L2	10

		1) Annealing 2) Carburizing		
	b	What is hardening? Explain with a neat sketch induction hardening.	L4	10
OR				
Q. 08	a	Define heat treatment. Explain its classification.	L1,L4	10
	b	Explain the process of flame Hardening and induction hardening.	L4	10
Module-5				
Q. 09	a	Define composite materials and explain the different types of composite material.	L1,L4	10
	b	Explain with a neat sketch the production of fiber reinforced plastics.	L4	10
OR				
Q. 10	a	Define refractories. Explain briefly the types of ceramics.	L1,L4	10
	b	Compare the properties and composition of grey cast iron and malleable iron.	L4	10