

Third Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025

Material Science

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1				M	L	C
Q.1	a.	Explain the following terms: i) Unit cell ii) Space lattice iii) Coordination number		6	L2	CO1
	b.	Derive an expression for APF for an BCC unit cell.		8	L3	CO2
	c.	Aluminium atom has FCC structure and an atomic radius of 0.143 nm. Calculate the volume of its unit cell in cubic meters.		6	L3	CO2
OR						
Q.2	a.	What are crystal imperfections? Explain line defects in detail.		12	L2	CO1
	b.	The unit cell of chromium is cubic and contains 2 atoms. Determine the dimension of the chromium unit cell. Given $A = 52$. The density of chromium is 7.19 Mgm^{-3} .		8	L3	CO2
Module – 2						
Q.3	a.	Define the following: i) Toughness ii) Stiffness iii) Resilience iv) Ductility v) Tangent modulus		10	L2	CO1
	b.	With a neat sketch, explain the stress: strain diagram for mild steel.		10	L2	CO2
OR						
Q.4	a.	Define fracture. Sketch and explain the stages of ductile fracture.		8	L2	CO2
	b.	Explain the factor affecting fatigue life.		6	L2	CO1
	c.	With a neat sketch, explain creep curve.		6	L2	CO2
Module – 3						
Q.5	a.	Define homogeneous nucleation. Derive an expression for critical radius in homogeneous nucleation.		12	L3	CO3
	b.	Explain the following systems: i) Eutectic system ii) Eutectoid system.		8	L2	CO2

OR

Q.6	a.	Sketch and explain Iron-Carbon equilibrium diagram and explain the various phases.	10	L3	CO3
	b.	State and explain any ten alloying elements and their effects on steel.	10	L2	CO1

Module – 4

Q.7	a.	Explain briefly about aluminium and its alloys.	10	L2	CO3
	b.	Compare the composition, properties and applications of gray CI with SG iron.	10	L3	CO4

OR

Q.8	a.	Define corrosion. Explain the different types of corrosion.	10	L3	CO3
	b.	Enumerate the properties and parameters to be considered in the fabrication of permanent joints.	10	L3	CO4

Module – 5

Q.9	a.	With a neat sketch, explain the T-T-T curve for hypoeutectoid steel.	10	L3	CO3
	b.	Write the classification of annealing process. Explain any two of them.	10	L3	CO2

OR

Q.10	a.	With neat sketch explain Jomine end quench test.	8	L2	CO3
	b.	Explain the following: i) Carburizing ii) Induction hardening iii) Flame hardening.	12	L3	CO4
