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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Third Semester, B.E. - Mechanical Engineering

Semester End Examination; March / April - 2022

Material Science and Metallurgy

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Explain the internal Structure of Crystalline Solid, Stacking of layers, Coordination Number and Atomic Packing Factor for different crystal structure, Crystal imperfections and diffusion.

CO2: Explain the concept of Stress and strain, Hardness and plastic deformation.

CO3: Analyze phase diagram and Iron Carbon Equilibrium diagrams.

CO4: Explain heat treatment process to improve the physical and mechanical properties of different types of engineering materials.

CO5: Explain the concept of corrosion and different methods of prevention of corrosion.

CO6: Explain microstructures and different types of alloys.

***Note**: I) **PART - A** is compulsory. **Two** marks for each question.*

*II) **PART - B**: Answer any **Two** sub questions (from a, b, c) for Maximum of **18 marks** from each unit.*

Q. No.	Questions	Marks	BLs	COs	POs
	I : PART - A	**10**			
I a.	State Fick's law of diffusion.	2	L1	CO1	PO1
b.	Define stiffness of a material and also define elastic strength.	2	L2	CO2	PO2
c.	Define Gibb's phase rule.	2	L2	CO3	PO1
d.	List out any four types of annealing process.	2	L2	CO4	PO2
e.	Define composite materials. Give one example.	2	L2	CO5	PO2
	II : PART - B	**90**			
	UNIT - I	**18**			
1 a.	Describe the factors affecting diffusion.	9	L3	CO1	PO1
b.	Explain any three types of point imperfections.	9	L3	CO1	PO2
c.	Define APF and calculate APF for FCC structure.	9	L3	CO1	PO7
	UNIT - II	**18**			
2 a.	Describe the mechanical properties of a material in plastic range with the help of stress strain diagram.	9	L3	CO2	PO2
b.	Describe the three stages of creep, with the help of creep curve.	9	L3	CO2	PO3
c.	Discuss RR Moore Fatigue testing technique with neat diagram and plot S-N curves for various materials.	9	L4	CO2	PO3
	UNIT - III	**18**			
3 a.	Characterize the factors governing the formation of best substitutional solid solutions (Hume-Rothay's rules).	9	L4	CO3	PO2
b.	Briefly describe the types of phase diagram.	9	L3	CO3	PO4
c.	Briefly describe the phases in Fe-C system with the help of Iron-Carbon diagram.	9	L3	CO3	PO4

Contd... 2

	UNIT - IV	**18**			
4 a.	Explain Jominy-End quench test with the help of neat sketch.	9	L3	CO4	PO6
b.	Define carburizing and briefly describe the three types of carburizing process.	9	L3	CO4	PO3
c.	Briefly describe the different types of annealing process.	9	L3	CO4	PO3
	UNIT - V	**18**			
5 a.	Discuss the Ingredients, types and applications of Brasses.	9	L3	CO5	PO1
b.	Distinguish between Thermoset and Thermoplastic polymers.	9	L3	CO5	PO3
c.	Describe Filament winding process with a neat sketch.	9	L3	CO5	PO6

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