



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

(An Autonomous Institution affiliated to VTU, Belagavi)

Fourth Semester, B. E. - Industrial and Production Engineering

Semester End Examination; July / August - 2022

Material Science and Metallurgy

Time: 3 hrs

Max. Marks: 100

Course Outcome's

The Students will be able to:

CO1: Know the Fundamental concepts of Materials, and different Structures of Materials and common types of defects in the materials.

CO2: Analyze the concept and mechanism of Fracture, Fatigue and Creep.

CO3: Construct and analyze the different types of Solid Solutions and Iron Carbon Equilibrium diagram.

CO4: Analyze the different heat treatment techniques to improve the specific properties of the engineering materials.

CO5: Identify the composition, properties and application of ferrous, non-ferrous materials and composite materials.

Note: i) **PART-A** is compulsory. One question from each unit for maximum of 2 marks

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

Q. No.	Questions	Marks	BLs	COs
I : PART - A		10		
I a.	Define Fick's law of diffusion.	2	L1	CO1
b.	Write any two difference between normalizing and annealing process	2	L1	CO2
c.	Define composite material	2	L1	CO3
d.	Write the benefits of heat treatment.	2	L1	CO4
e.	Define unit cell.	2	L1	CO5
II : PART - B		90		
UNIT - I		18		
1 a.	What is APF? Calculate atomic packing factor for BCC and HCP structure	10	L3	CO1
b.	Briefly explain crystal imperfections	9	L1	CO1
c.	Explain stress strain diagram with all salient feature for mild steel	9	L1	CO1
UNIT - II		18		
2 a.	With sketches explain stages of creep.	9	L1	CO2
b.	Define fatigue? explain SN curve	9	L1	CO2
c.	Briefly explain cooling curve for Cu-Ni material and also explain gib's phase rule.	9	L1	CO2
UNIT - III		18		
3 a.	Explain iron carbon diagram and also explain different phases of the same.	9	L1	CO3
b.	Explain TTT curve for hypo, hyper eutectoid steel.	9	L1	CO3
c.	With sketches explain microstructure of slowly cooled steel.	9	L1	CO3

UNIT - IV

18

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| 4 a. | Briefly explain with neat diagram tempering and martempering process. | 9 | L1 | CO4 |
| b. | Explain with heat diagram pack carbonizing | 9 | L1 | CO4 |
| c. | Explain properties, composition, and uses of gray CI and malleable cast Iron. | 9 | L1 | CO4 |

UNIT - V

18

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| 5 a. | Write the properties, composition, and uses of copper alloy, brasses, and bronzes. | 9 | L1 | CO5 |
| b. | Write the classification of composite material. | 9 | L1 | CO5 |
| c. | Write with neat diagram , fundamental production of MMC's | 9 | L1 | CO5 |

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