***U.S.N*** | | | | | | | | | | |

# 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 |

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| | **UNIT - IV** | **18** | | |
| 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** | | |
| 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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