**20ME401**

**Hall Ticket Number:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **II/IV B.Tech (Regular) DEGREE EXAMINATION** | | | |
| **Aug/Sept, 2022** | **Mechanical Engineering** | | |
| **Fourth Semester** | **Materials Engineering** | | |
| **Time:** Three Hours | | **Maximum :** 70 Marks | |
| *Answer Question No.1 compulsorily.* | | | (1X14 = 14 Marks) |
| *Answer ONE question from each unit.* | | | (4X14=56 Marks) |

**1.** Answer all questions (1X14=14 Marks)

|  |  |  |
| --- | --- | --- |
| a) What is crystallography | CO1 | L1 |
| b) Define the Packing factor | CO1 | L2 |
| c) Define atomic packing factor and write atomic packing factor for BCC | CO1 | L1 |
| d) What is slip explain it with a suitable example. | CO2 | L2 |
| e) What is the difference between alloy and composite. | CO2 | L1 |
| f) Write short notes on martensite | CO2 | L2 |
| g) What is the purpose of Nitriding? | CO3 | L1 |
| h) Write short notes on Bainite | CO3 | L2 |
| i) What is the necessity of heat treatment of steels | CO3 | L1 |
| j) Define age hardening | CO3 | L1 |
| k)Write different types of the surface hardening process | CO4 | L1 |
| l)What is the necessity of composite materials? | CO4 | L2 |
| m) Explain compacting in powder metallurgy. | CO4 | L1 |
| n) Write examples for aluminium alloys and their applications | CO4 | L2 |

**UNIT – I**

|  |  |  |  |
| --- | --- | --- | --- |
| 2.a | Prove that FCC is more closely packed than BCC by calculating the atomic packing factor for both | CO1 L1 | 7M |
| 2.b | Discuss different types of crystal imperfections. | CO1 L3 | 7M |

**(OR)**

|  |  |  |  |
| --- | --- | --- | --- |
| 3.a | Explain Hume-Rothery principles in developing solid solution alloys | CO1 L2 | 7M |
| 3.b | Draw the seven basic crystal structures and write the unit cell parameters. | CO1 L3 | 7M |

**UNIT – II**

|  |  |  |  |
| --- | --- | --- | --- |
| 4.a | Draw iron-iron carbide phase diagram and explain all zones. | CO2 L4 | 7M |
| 4.b | Describe structural changes that take place when plain carbonsteels:0.8 %C,0.4%C,1.2%C are cooled from austenite region to room temperature | CO2 L4 | 7M |

**(OR)**

|  |  |  |  |
| --- | --- | --- | --- |
| 5.a | Draw the phase diagram and explain phase transformations in any one type of eutectic alloy | CO2 L4 | 7M |
| 5.b | Draw TTT diagram for eutectic steel and explain. | CO2 L1 | 7M |

**UNIT – III**

|  |  |  |  |
| --- | --- | --- | --- |
| 6.a | Explain hardening of steels and its advantages | CO3 L2 | 7M |
| 6.b | Discuss carburizing in low carbon steel | CO3 L4 | 7M |

**(OR)**

|  |  |  |  |
| --- | --- | --- | --- |
| 7.a | Write short notes on  i) Annealing, ii)Normalizing of steels | CO 3 L1 | 7M |
| 7.b | Explain briefly about dispersion strengthening | CO3 L2 | 7M |

**UNIT – IV**

|  |  |  |  |
| --- | --- | --- | --- |
| 8.a | Explain the steps involved in Powder Metallurgy | CO4 L2 | 7M |
| 8.b | Write the applications of metal matrix composites | CO4 L3 | 7M |

**(OR)**

|  |  |  |  |
| --- | --- | --- | --- |
| 9.a | Discuss Nanomaterials and their applications | CO4 L2 | 7M |
| 9.b | Explain the properties and applications of copper alloys? | CO4 L3 | 7 M |