Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **17ME2002** | **Duration :** | **3hrs** |
| **Sub. Name :** | **MATERIAL SCIENCE AND ENGINEERING** | **Max. Marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Define a crystal structure. | CO1 | 5 |
| b. | In which type of crystal structure mechanical twinning is more prevalent? | CO1 | 7 |
| c. | Illustrate a point defect with a neat sketch. | CO1 | 8 |
| **(OR)** | | | | |
| 2. |  | Describe the effect of the following property on metals:  a. Plasticity b. Ductility c. Yield strength d. Malleability e. Hardness | CO1 | 20 |
|  |  |  |  |  |
| 3. | a. | Discuss briefly about miller indices with neat sketches. | CO2 | 10 |
| b. | Derive and compare the atomic packing factor for FCC, BCC and HCP structures. | CO2 | 10 |
| **(OR)** | | | | |
| 4. | a. | List the materials that are prone for precipitation hardening. | CO3 | 10 |
| b. | Describe the mechanism behind precipitation hardening. | CO3 | 10 |
|  |  |  |  |  |
| 5. |  | Explain the three stages of annealing (recovery, recrystallisation and grain growth). | CO4 | 20 |
| **(OR)** | | | | |
| 6. | a. | What is meant by a Fracture? | CO4 | 5 |
| b. | Derive and explain the mechanisms of fracture with Griffith’s crack propagation theory. | CO4 | 15 |
|  |  |  |  |  |
| 7. | a. | Compare Creep and Fatigue failures. | CO5 | 5 |
| b. | Demonstrate the procedures to identify the creep and fatigue failures in metal. | CO5 | 15 |
| **(OR)** | | | | |
| 8. | a. | Enumerate the four Hume-Rothery rules for the solid solubility of one element in another and explain it with logical examples. | CO5 | 10 |
| b. | Elaborate on the methods to do the following heat treatment of metals and alloys: i) Martempering; ii) Austempering; iii) Nitriding; iv) Boriding; v) Flame Hardening. | CO5 | 10 |
|  | | **Compulsory**: |  |  |
| 9. |  | Draw the Fe-C equilibrium diagram and explain. | CO5 | 20 |