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

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**End Semester Examination – Nov/Dec – 2018**

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| **Code :** | **14ME2003** | **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. | Derive the atomic packing factor and coordination number for a BCC crystal structure. Enumerate the atomic packing factor for FCC and HCP structures. | CO1 | 10 |
| b. | Mention the importance of Miller Indices to Materials Engineers. | CO1 | 5 |
| c. | With a neat flow chart classify the engineering materials. | CO1 | 5 |
| (OR) | | | | |
| 2. | a. | List out the major differences between Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM) | CO1 | 5 |
| b. | With a neat sketch, describe the construction, working principle, advantages, limitations and applications of TEM. | CO1 | 15 |
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| 3. | a. | Summarize the term defect in crystal structure and list out the importance of understanding it. | CO2 | 7 |
| b. | Describe about the various defects in crystal structure with neat sketches. | CO2 | 8 |
| c. | What are slip planes? How does it affect the plastic deformation in crystal planes? | CO2 | 5 |
| (OR) | | | | |
| 4. | a. | Define diffusion. | CO2 | 5 |
| b. | Derive and explain the Fick’s law of diffusion for both steady state and unsteady state. | CO2 | 15 |
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| 5. | a. | Discuss the term fracture and differentiate between ductile fracture and brittle fracture. | CO3 | 5 |
| b. | Explain the mechanism behind ductile fracture with neat sketch. Hypothetically list out the parameters which affect the ductility of materials. | CO3 | 15 |
| (OR) | | | | |
| 6. | a. | Define creep and describe the creep mechanism with various stages involved in it. | CO3 | 15 |
| b. | Explain S-N curve and interpret the type of fracture associated with S-N curve. | CO3 | 5 |
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| 7. | a. | Illustrate the meaning of Solid solution with example. | CO4 | 5 |
| b. | Draw the phase diagram for Ni-Cu alloy and describe the procedure to estimate the phase composition using it. | CO4 | 15 |
| (OR) | | | | |
| 8. |  | Draw the Fe-C equilibrium diagram and explain it. | CO4 | 20 |
|  | | **Compulsory**: |  |  |
| 9. | a. | Why is hardening of material important? Explain the Jomny’s End Quench test to estimate the hardness of a material. | CO4 | 15 |
| b. | List all the heat treatment techniques for case hardening. | CO4 | 5 |