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



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

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| **Code :** | **14NT2002** | **Duration :** | **3hrs** |
| **Sub. Name :** | **MATERIALS SCIENCE AND ENGINEERING - I** | **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. | Copper has FCC structure and atomic radius 1.3 Å. Calculate its density. | CO1 | 3 |
| b. | Differentiate between amorphous and crystalline materials. | CO1 | 3 |
| c. | With neat sketch, describe the seven different crystal systems and mention the lattice parameters of each. | CO1 | 14 |
| **(OR)** | | | | |
| 2. | a. | Draw (001), (111) and (010) plane in a simple cubic unit cell. | CO1 | 3 |
| b. | Determine the atomic radius of a crystal of (i) BCC system and (ii) FCC system if the lattice parameter for the systems are 4.2 Å. | CO1 | 3 |
| c. | Calculate the number of atoms and packing factor for SC, BCC, FCC and HCP structures. | CO1 | 14 |
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| 3. | a. | Distinguish screw from edge dislocation with a suitable sketch. | CO1 | 3 |
| b. | Define dielectric constant. Give examples of dielectric materials. | CO2 | 3 |
| c. | Define polarization. Mention the different types of polarization and explain any two types of polarization in detail. | CO2 | 14 |
| **(OR)** | | | | |
| 4. | a. | Describe Burger circuit with a suitable sketch. | CO1 | 3 |
| b. | Differentiate between metals, semiconductors and insulators based on their energy band gap. | CO3 | 3 |
| c. | Define Hall effect. Derive the expression for Hall coefficient for an n-type semiconductor and list the applications of Hall Effect. | CO3 | 14 |
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| 5. | a. | Define ‘doping’ with respect to semiconductors. | CO3 | 3 |
| b. | Differentiate between Schottky and Frenkel defect. | CO1 | 3 |
| c. | With suitable examples, discuss in detail the intrinsic and extrinsic semiconductors. | CO3 | 14 |
| **(OR)** | | | | |
| 6. | a. | Define grain boundary with a suitable sketch. | CO1 | 3 |
| b. | Explain the deformation that takes place by the movement of dislocations. | CO1 | 3 |
| c. | Explain in detail, the different types of Lattice defects in a crystalline material. | CO1 | 14 |
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| 7. | a. | List the necessary conditions for diffusion to occur. | CO1 | 4 |
| b. | Mention Fick’s first and second law in equation form and describe all the parameters. | CO1 | 6 |
| c. | Discuss in detail the various factors that affect diffusion. | CO1 | 10 |
| **(OR)** | | | | |
| 8. | a. | Distinguish steady from non-steady state diffusion. | CO1 | 3 |
| b. | Differentiate between vacancy diffusion and interstitial diffusion. | CO1 | 5 |
| c. | Discuss the atomic mechanisms of diffusion. Identify the more probable mechanism with suitable justification. | CO1 | 12 |
|  | | **Compulsory**: |  |  |
| 9. | a. | Discuss the application of diffusion in doping of semiconductors with suitable examples. | CO3 | 12 |
| b. | Explain the role of diffusion in sintering. | CO3 | 8 |