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



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – April/May– 2017**

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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 1.278 Å. Calculate its density. | CO1 | 2 |
| b. | Differentiate amorphous and crystalline materials. | CO1 | 3 |
| c. | With neat sketch, differentiate the seven different crystal systems. Mentions their lattice parameters. | CO1 | 15 |
| (OR) | | | | |
| 2. | a. | Draw (100), (110) and (111) planes in a cubic unit cell. | CO1 | 3 |
| b. | Define coordination number. Mention the coordination number for Simple cubic and body centered cubic structure. | CO1 | 3 |
| c. | Calculate the number of atoms and packing factor for SC, BCC and FCC structures. | CO1 | 14 |
| 3. | a. | Write short notes on doping of semiconductors with suitable examples. | CO3 | 3 |
|  | b. | Differentiate semiconductors and insulators based on their band gaps. Give examples. | CO3 | 3 |
|  | c. | Derive the expression for Hall coefficient for an n-type semiconductor and list the applications of Hall Effect. | CO3 | 14 |
| (OR) | | | | |
| 4. | a. | What is Burger circuit? | CO1 | 2 |
|  | b. | Differentiate p-type and n-type semiconductors. | CO3 | 4 |
|  | c. | Explain in detail, the different types of point defects and line defects in a crystalline material. | CO1 | 14 |
| 5. | a. | What type of deformation takes place by the movement of dislocations. | CO2 | 2 |
|  | b. | Write Fick’s second law in equation form and describe all the parameters. | CO2 | 3 |
|  | c. | With suitable examples, discuss in detail about intrinsic and extrinsic semiconductors. | CO3 | 15 |
| (OR) | | | | |
| 6. | a. | Define dielectric constant. | CO3 | 2 |
|  | b. | Define polarization. | CO3 | 2 |
|  | c. | Define doping in semiconductors. | CO3 | 2 |
|  | d. | Explain electronic and ionic polarization in detail. | CO3 | 14 |
| 7. | a. | Distinguish between steady and non-steady state diffusion. | CO2 | 4 |
|  | b. | Write short notes on grain boundaries. | CO1 | 2 |
|  | c. | Describe the atomic mechanisms of diffusion. Which mechanism is more probable? Why? | CO1 | 14 |
| (OR) | | | | |
| 8. | a. | Write short notes on Kirkendall effect. | CO2 | 3 |
|  | b. | Differentiate vacancy diffusion and interstitial diffusion. | CO2 | 3 |
|  | c. | Expalin the surface and volume defects in detail. | CO2 | 8 |
|  | d. | Explain Fick’s first and second law in detail. | CO2 | 6 |
|  | | **Compulsory**: |  |  |
| 9. | a. | Explain in detail, the various factors that affect diffusion. | CO2 | 5 |
|  | b. | Describe the application of diffusion in sintering and doping of semiconductors, with suitable examples. | CO2 | 15 |

ALL THE BEST