Karunya University
(Karunya Institute of Technology and Sciences)
(Declared as Deemed to be University under Sec.3 of the UGC Act, 1965)

End Semester Examinations - 2015-16 Even Semester - May 2016

14NT2002 Materials Science and Engineering – I

Set A

Time : 3 hrs
Total Marks: 100

1. a) Distinguish between crystalline and amorphous materials. (3 m)

   b) Copper has FCC structure and atomic radius 1.278 Å. Calculate its density. (3 m)

   c) Explain the terms co-ordination number, packing factor and calculate the same for SC, BCC and FCC structures. (14 m)

OR

2. a) Calculate the atomic radius of a crystal of (i) BCC system and (ii) FCC system if the lattice parameter for the systems are 3.6 Å. (3 m)

   b). Sketch the (100), (110) and (111) planes of a simple cubic structure (3 m)

   c) i) Specify the point coordinates for all atomic positions for a BCC unit cell. (6 m)

   ii) Define crystallographic direction. Mention the different steps in determination of crystallographic directions and planes. (8 m)

3. a) What are dielectric materials? Define dielectric constant. (3 m)

   b) Differentiate intrinsic and extrinsic semiconductors with suitable examples. (3 m)

   c) What is polarisation? List the different types of polarisation. Explain in detail, any two types of polarisation. (14 m**)**

OR

4. a) Write short notes on doping of semiconductors. (3 m)

   b) Define Burger vector with a neat sketch. (3 m)

   c) Define Hall Effect. How to distinguish between p-type and n-type semiconductors based on Hall Effect measurement. (14 m)

5. a) Define dislocation movement. What type of deformation takes place by the movement of dislocations? (3 m)

   b) Differentiate Schottky defect and Frenkel defect. (3 m)

   c) With suitable examples, discuss in detail about intrinsic and extrinsic semiconductors. (14 m)

OR

6. a) With a suitable sketch differentiate vacancy and interstitial defect? (3m)

   b) What is the difference between grain and grain boundary. (3m)

   c) Discuss in detail, the different types of Lattice defects in a crystalline material. (14 m)

7. a) Calculate the diffusivity of carbon in γ- Fe at 927^{o}C. D_o = 2 x 10^{-5} m^2/s and Q = 142 kJ/mol. (R = 1.987 cal/mol.k) (3 m)

   b) Distinguish between steady and non-steady state diffusion. (3 m)

   c) Describe the atomic mechanisms of diffusion. Which mechanism is more probable? Why? (14 m)

OR

8. a) What are the two necessary conditions for diffusion to occur? (3 m)

b) Define Kirkendall effect. (3m)

c) Differentiate vacancy diffusion and interstitial diffusion with suitable sketch. Which among these mechanisms is more probable. (14 m)

9. Describe in detail, the application of diffusion in sintering and doping of semiconductors, with suitable examples. (20 m)

Wishing you All the Best
