M.Tech. 1st Semester Civil Engg. Specialisation in Structural Design Examination,

December–2017

MATERIAL SCIENCE

Paper-MTSD-110

Time allowed : 3 hours] *[Maximum marks : 100*

Note : *Attempt any **five** questions. All questions carry equal marks. Assume any missing data, if required.*

1. (a) Why it is important to study material science and engineering ?

(b) What is the difference between atomic structure and crystal structure ?

(c) Enlist factors affecting selection of a material. 7+7+6

2. (a) On the basis of crystal structure, find the theoretical density for sodium chloride. Compare it with measured density also.

(b) For a ceramic compound, what are the two characteristics of the component ions that determine the crystal structure.

(c) Briefly describe diffusion mechanism of solid and its application. 7+7+6

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

   (b) Derive expression for the relative amount of the phases present at equilibrium using Lever rule. 10+10

4. (a) Name the two stages involved in the formation of particles of a new phase. Describe each stage briefly.

   (b) Briefly describe the phenomena of superheating and supercooling. Why do these phenomena occur? 10+10

5. (a) What is the principal difference between wrought and cast alloys ?

   (b) Write a short note on Home Rothery's rule for alloys. 10+10

6. A continuous and aligned glass fibre reinforced composite consist of 40 volt % of glass fibre having a modulus of elasticity of 67 GPa and 60 Vol % of a polyester resin displays a modulus of 30 GPa. Calculate the modulus of plasticity of their composite in the longitudinal direction. If the cross sectional area is 250 mm^2 and stress applied is 50 MPa in longitudinal direction. Calculate the load carried by each of the fibre and matrix phase. 20

7. (a) What are the conditions under which corrosion occurs ? What are the measures that may be taken to prevent or control corrosion ?

   (b) Briefly write about performance of material under high temperature. 10+10

8. Write short note on : 5×4=20

   (a) Composite material

   (b) Casehardening

   (c) Hydration mechanism

   (d) Radiation damage