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Total No. of Pages : 02

Total No. of Questions : 08

M.Tech. (Structural Design) (Sem.–2) MATERIAL SCIENCE Subject Code : MTSD-108 M.Code : 74295 Date of Examination : 20-12-22

Time: 3 Hrs.

Max. Marks: 100

INSTRUCTION TO CANDIDATES :

- 1. Attempt any FIVE questions out of EIGHT questions.
- 2. Each question carries TWENTY marks.
- 1. a) How are materials classified? Explain the important properties off materials making it fit for engineering applications.
 - b) What are the factors which need to be considered for the selection of materials for different uses? Explain.

2. **Explain the following :**

- a) Diffusion mechanism of solid
- b) Describe FCC, BCC and HCP lattice structures.
- 3. a) If aluminium has an FCC crystal structure and an atomic radius of 0.143 nm, calculate the volume of its unit cell in m³. Also, calculate the density if atomic mass is 26.98 g/mole.
 - b) Show that for the face-center cubic crsytal structure, the unit cell edge length 'a' and the atomic radius 'r' are related through a relationship; $a = 2\sqrt{2r}$.
- 4. a) Write a note on "Substitutional solid solution".
 - b) For what purpose we use substitutional solid solution and interstitial solid solution. Illustrate.
- 5. Define ceramic materials. How ceramics are made and what are the types of clay and their common ceramic uses.
- 6. a) What are the types of organic materials? How these are useful for soils?

- b) Differentiate between :
 - (i) Oxidation and Corrosion
 - (ii) Fatigue and Fracture
- 7. How are plastics classified? Draw and explain the different types polymer chain structure.
- 8. Write short notes on :
 - a) The hydration mechanism in cement and concrete.
 - b) Radiation damages
 - c) Ultra performance concrete.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.