Roll No. | | | | | | | | | | | | |

Total No. of Pages : 02

Total No. of Questions : 08

M.Tech. Structural Design (2016 & Onwards) (Sem.–2)

MATERIAL SCIENCE

Subject Code : MTSD-108

Paper ID : [74295]

Time : 3 Hrs. Max. Marks : 100

INSTRUCTION TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWENTY marks.

Q1. a) Explain the important properties of materials making it fit for engineering applications.

b) What are the factors to be considered while selecting materials for engineering applications? Explain.

Q2. Explain the following :

a) Crystal planes and directions.

b) Lattice Defects and crystal imperfections.

Q3. a) If aluminum has an FCC crystal structure and an atomic radius of 0.143 nm, calculate the volume of its unit cell in m^3. Also, calculate the density if atomic mass is 26.98 g/mole.

b) Show that for the face-center cubic crytal structure, the unit cell edge length 'a' and the atomic radius 'r' are related through a relationship; $a = 2\sqrt{2}r$.

Q4. What are phase diagrams? How are they useful? Draw and explain the iron - carbon phase diagram showing liquid, liquid-solid and solid phases.

Q5. a) Describe the five classes of ceramic materials.

b) What are the four types of organic solids used in engineering applications? Define each one with examples.

Q6. a) Describe the mechanical tests used to measure properties of steel.

b) Describe the heat treatment processes to enhance the properties of steel. Compare the merits and demerits.

Q7. a) How are plastics classified? Draw and explain the different types polymer chain structure.

b) Explain the hydration mechanism of cement. Define the C-S-H phase of cement paste.

Q8. Write notes on :

a) Microscopic composites.

b) Solid solutions.

c) Home Rathery's rule.

d) Self compacting concrete.