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ET-204(A)

00455

B.Tech. Civil (Construction Management)

Term-End Examination

June, 2010

ET-204(A) : MATERIALS SCIENCE

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any seven questions. Answer should be brief and to the point. Use of calculator is allowed.*

1. (a) Determine Packing Fraction (PF) for BCC and FCC structure. **5+5**

(b) Iron at 20°C is BCC with atoms of atomic radius 0.124 nm. Calculate lattice constant 'a' for the cube - edge of iron cell.

2. (a) Distinguish between metals and alloys giving suitable examples. **5+5**

(b) What is a polymer ? Describe uses of polymers and their manufacturing process. Distinguish between rubber and polymer.

3. (a) Explain : **5+5**

(i) Covalent bonding

(ii) Ionic bonding

(b) Cite the main differences between Vander Waals and hydrogen bonding.

4. How do you classify the defects in solids ? Explain briefly about the, 10

   (a) Burger's Circuit, and

   (b) Significance of Burger's Vector

5. In an experiment to measure Young's modulus, a load of 5000 N hanging from a steel wire of length 3 m and cross section 0.20 cm^2, was found to stretch the wire by 0.4 cm above its no load length. Calculate the stress, the strain and the value of Young's modulus for the steel of which the wire was made. 10

6. (a) How does corrosion of reinforcement steel lead to the failure of concrete structure ? Explain. 5+5

   (b) In order to protect a sheet of a steel, which of the following metals will you use as coating for corrosion protection under aqueous environment :

   Chromium, Nickel, Zinc or Copper

   Justify your choice(s) in brief.

7. Describe the phenomenon of super-conductivity. Discuss the features of Type I and Type II superconductors. 10

8. List the important alloys of Iron and Carbon ? Explain with the aid of Iron-Carbon diagram any two of them. **10**

9. (a) Explain the necessity of heat treatment for steels. Describe the process of quenching. **5+5**

   (b) Explain briefly about the TTT curves.

10. (a) A piece of copper originally 305 mm long is pulled in tension with a stress of 276 MPa. If the deformation is entirely elastic, what will be the resultant elongation ? **5+5**

   Take E for copper $= 11.0 \times 10^4$ MPa.

   (b) A cylindrical specimen of steel having an original diameter of 12.8 mm is tensile tested to fracture and is found to have an engineering fracture strength of 460 MPa. If its cross - sectional diameter at fracture is 10.7 mm; determine.

   (i) the ductility in terms of percent area reduction, and

   (ii) the true stress at fracture.