Roll No .....

AU/IP/ME/PR - 402

B.E. IV Semester Examination, December 2014

Material Science & Metallurgy

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.
ii) All parts of each questions are to be attempted at one place.
iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.
iv) Except numericals, Derivation, Design and Drawing etc.

1. a) Distinguish between ionic and metallic bonds in solids.
   b) What do you understand by the term 'crystal lattice' and how many types of this are found in metal?
   c) Show that the atomic packing factor (volume of atoms/volume of unit cell) for FCC and BCC structure and 0.74 and 0.68 respectively.
   d) What properties should be considered while selecting acid, basic, and natural refractory?

   OR

   How do you differentiate iron from steel? Name the various methods of making iron and steel and explain any one process.

2. a) Explain the difference between slipping and twinning.
   b) Give the comparison between edge dislocation and screw dislocations.
   c) Write short notes on the following : i) Recrystallization ii) Grain growth
   d) What is hot and cold working of metals? Also explain the effect of cold working on mechanical properties of metals.

   OR

   Distinguish between ductile and brittle fracture. Name two ductile and two brittle metallic materials.

3. a) State Hume-Rothery's rules for the formation of substitutional type of solid solutions.
   b) State 'Gibb's phase rule'. What is its importance/utility?
   c) Draw the cooling curves for a binary system forming eutective solution. Explain, how cooling curves are useful.
   d) Draw the iron-carbon equilibrium diagram and explain it.

   OR

   Explain the following: i) Eutectic system ii) Peritectic system iii) Eutectoid system

4. a) What is the object of heat treatment? List the various heat treatment processes.
   b) Define the term hardenability. What factors affect hardenability?
   c) Explain briefly the theory of tempering.
   d) Draw TTT diagram for eutectoid steel and explain the effect of cooling rate on the transformation products and hardness obtained.

   OR

   Explain the following : i) Annealing ii) Spheroidizing iii) Hardening

5. a) What are the properties of FRP?
   b) What is bronze? Name various types of bronzes.
   c) What is mean by thermoplastics and thermosetting plastics.
   d) With a neat sketch, explain the creep testing method for metal.

   OR

   Explain the advantages and disadvantages of using powder metallurgy.

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