B.E. Met Part-II 3rd Semester Examination, 2011

Introduction to Materials (MT-301)

Full Marks: 70 **Time: 3 Hours**

Answer any seven questions.
All questions carry equal marks

1 (a) Discuss the characterization of refractory materials and name their applications.
(b) Give example of two materials each for (i) aerospace and (ii) bio-medical applications. Discuss clearly why these materials are selected for their respective applications.

[5+5]

2 (a) Distinguish between (i) Forging and Extrusion, (ii) cold rolling and hot rolling
(b) Select i) A method that can produce a brass top weighing 300 gm as well as a steel roll, weighing two tonnes, (ii) a method to produce aluminium channels of different cross section (iii) a method to produce axle of a truck.
(c) Out line the nature of bonds in metallic materials as compared to ceramic materials.

[4+3+3]

3 (a) What are the important principles, which should considered for selection of materials in engineering manufactures?
(b) Discuss a few properties of metal, ceramic and composite.

[6+4]

4 (a) Discuss the role of microstructures on mechanical properties of metallic materials.
(b) Discuss the criteria for development of engineering components.

[5+5]

5 (a) How do you construct a phase diagram from its cooling curve at various compositions.
(b) Name the metallic materials suiting the following application with justification
(i) onshore small vessels, (iii) High temperature

[6+4]

6 (a) Draw net sketch of Fe-Fe_3C phase diagram with appropriate identification of temperatures, compositions and phases fields.
(b) Discuss the importance and limitation of phase diagrams.

[6+4]

7 (a) An ASTM grain size determination is being made on a micrograph of a metal at a magnification of 1X. What is the ASTM grain size number of the metal if there is 820 grain per square mm?
(b) Define the hardness of a metal. Mention the different types of hardness test.
(c) What is fatigue life of metal? Draw the stress amplitude(S)-number of cycles(N) curves for a carbon steel and an aluminium alloy.

[2+4+4]

8 (a) Define Creep of metals. Show a characteristic creep curve and describe three stages in creep deformation.
(b) What are the differences between ductile and brittle fracture?

[5+5]

9 (a) Differentiate between edge dislocation and screw dislocation.

(b) Name the different types of welding techniques. Differentiate between brazing and soldering.

[4+6]

10 (a) Draw the (121) plane and [101] direction in a cubic system.

(b) What is the angle between the (012) and (120) planes in cubic system.

(c) Calculate the atomic packing factor (APF) for face centred cubic (FCC) and hexagonal close packed (HCP) crystal.

[2+2+6]

11 Write shorts Notes (*any three*)

(a) Free Energy

(b) Entropy

(c) polymorphism

(d) Isomorphous system

(e) Frenkel and schottky defects