

II B.Tech II Semester Supplementary Examinations, April/May 2005
METALLURGY AND MATERIAL SCIENCE
(Common to Mechanical Engineering, Mechatronics and Production Engineering)

Time: 3 hours**Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Draw the close packed planes and directions in simple cube, BCC and FCC crystals and find out the Miller indices of the planes.
(b) Explain briefly about the various types of crystal imperfections, with the help of neat sketches.
2. (a) Explain the differences between an alloy and alloy system.
(b) How are the alloy systems classified based on the number of elements present in it. Explain them with suitable examples.
(c) Distinguish between homogeneous alloy and heterogeneous alloys.
3. (a) Determine the phase present, the composition of each of the phases, and the relative amounts of each phase for 1.0% C steel at 810⁰C, 760⁰C and 700⁰C (Assume Equilibrium conditions). How much of pearlite is present at each of these, temperatures.
(b) What is an invariant reaction? Identify and explain three invariant reactions in the $Fe - Fe_3C$ system.
4. (a) What are the reasons for the good resistance to corrosion possessed by stainless steels. Explain them.
(b) Discuss the purpose of adding the following alloying elements to steels.
 - i. Nickel
 - ii. Chromium
 - iii. Manganese.
5. (a) Explain the differences between hardness and hardenability.
(b) Describe Jominy End Quench test.
(c) Discuss the effect of alloying elements on hardenability.
(d) Explain critical cooling rate.
6. (a) Explain why copper is a suitable material for Automobile radiators.
(b) What is dezincification? How it may be minimized.
(c) How does the addition of lead to brass improve its machinability.
7. (a) Write a short note on ceramic tools.

- (b) List out the advantages and disadvantages of ceramic tools.
 - (c) List out the electrical properties of ceramic materials.
 - (d) Give reasons why there exist many types of ceramics?
8. (a) Explain what is meant by chemical bonding and mechanical bonding as it relates to a fiber-matrix interface.
- (b) Explain why it is necessary to thoroughly clean the surfaces of glass fibers to achieve a strong bond with epoxy matrix.
 - (c) Explain why a strong interface is detrimental to the properties of ceramic-matrix composites.

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