R09

Code No: 09A30306

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B.Tech II Year I Semester Examinations, November/December-2013
Metallurgy and Material Science
(Common to ME, MCT, AME, MIM)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

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1.a) What is a crystalline material? Distinguish between single crystal material and polycrystalline material?
b) Define the terms Space lattice, unit cell, solid solution and monotectic reaction. [15]

2.a) Determine the crystal structure for the following: A metal with $a_o = 4.9489\ A^0$, $r = 1.75\ A^0$ and one atom per lattice point. A metal with $a_o = 0.429$ of nm, and $r = 0.1858$ nm, and one atom per lattice point.
b) Explain the difference between an allotropy and a polymorphism with examples. [15]

3. Metal A and B are completely soluble in both the liquid and solid states. The melting point of A is 3225^0F and that of B is 1945^0F. An alloy containing 40%B starts to solidify at 2910^0F by separating crystals of 15%B. An alloy containing 70%B starts to solidify at 2550^0F by separating crystals of 37%B.
a) Draw the equilibrium diagram to scale on a piece of graph paper and label all points, lines and areas.
b) For an alloy containing 70%B
(i) Give the temperature of initial and final solidification
(ii) Give the chemical composition and relative amount of the phases present at 2440^0F.
(iii) Draw the cooling curve of this alloy. [15]

4.a) Draw the neat sketch of Cu-Sn alloy phase diagram (upto 30%Sn) and label all important points, lines and phases in it.
b) Define the following terms:
(i) Eutectoid reaction
(ii) Pearlite
(iii) Miscibility gap
(iv) Martensite. [15]

5.a) Differentiate between annealing and normalizing.
b) Explain the effect of alloying elements on hardenability.
c) Describe Jominy end quench test. [15]

6. Explain the different methods of surface hardening treatments. [15]

7. Define and explain the following terms:
a) Nano materials
b) Cermets
c) Glass
d) Abrasives. [15]

8.a) What is a composite material? Explain the classification of composite materials with examples.

b) Explain the role of fiber, matrix and interface in fiber reinforced composites.

[15]

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