

MECHANICAL ENGINEERING BRANCH
FOURTH SEMESTER-REGULATION 2012

ML8351 ENGINEERING MATERIALS AND METALLURGY

Time: 3Hr

Max.Mark:100

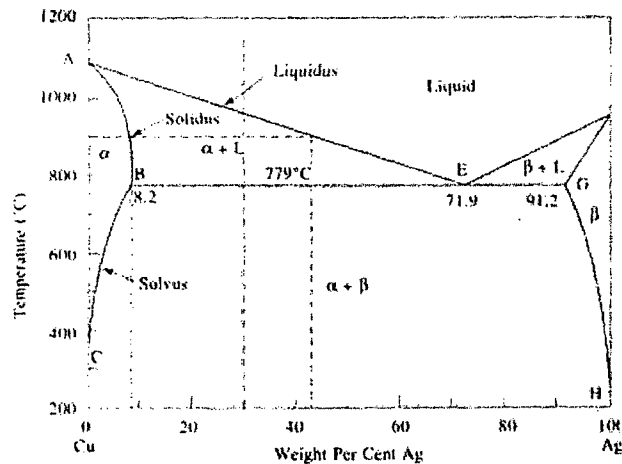
Answer ALL Questions

Part –A (10x2=20 Marks)

1. Draw a cooling curve of 'pure metal' and 'alloy' and mark the regions
2. Pearlite formation is diffusion process-True or false: Justify your answer
3. List out the elements that do not alloy with iron.
4. What are the diffusion mechanisms?
5. What does AZ92A refer to?
6. Match the following
 - a. Ni based super alloys
 - b. Invar(Fe/35 Ni)
 - c. Permalloy
 - d. Ti alloy
 1. Magnetic applications
 2. Gas turbine blades
 3. HCP < -- > BCC
 4. metrology standards
7. Distinguish between addition and condensation polymerization.
8. Why properties of nanomaterials are superior to its microcrystalline?
9. Draw a fatigue cycle for R=-1
10. Distinguish between intergranular and transgranular fracture.

Part – B (5x16 = 80 Marks)

- 11 (i) The alloy phase diagram of Cu-Ag system is given in fig. An alloy of Cu-30 wt% Ag is cooled slowly from 1200°C. From the data given in the phase diagram calculate the following: (i) The amount of liquid and proeutectic α at 900°C, (ii) the amount of Proeutectic α and liquid formed just before the eutectic reaction (iii) the amount of α and β formed at 600°C. (6)



- (ii) Draw the iron-iron carbide equilibrium diagram and mark all the regions and explain the important reactions (10)

- 12a (i)** Calculate the critical radius of homogeneous nucleation **(8)**
(ii) Explain (a) Martempering (b) annealing **(8)**
OR
- 12b (i)** What is carburizing? Explain the different types of carburizing. Discuss the property changes after the carburizing **(16)**
- 13a (i)** Discuss the mechanism of precipitate strengthening **(8)**
(ii) Discuss the characteristics of different types of cast-iron **(8)**
OR
- 13b (i)** Discuss the effect of alloying additions (Mn, Si, Cr, Mo, V, Ti & W) on steel **(10)**
(ii) Write the properties and applications of brass **(6)**
- 14a (i)** Discuss the properties and applications of Al_2O_3 and SiC **(8)**
(ii) Discuss the applications of (a)PMMA (b)PVC (c)HDPE **(8)**
OR
- 14b (i)** How composites are different from alloys. What are the matrix and reinforcement materials for MMCs **(4)**
(ii) Explain the toughening mechanism of CMCs **(4)**
(iii) Derive an expression to calculate the young's modulus of the composite material along the fiber direction **(8)**
- 15a (i)** What is fatigue? Explain the mechanism of fatigue fracture and explain the method to improve the fatigue life of the component **(10)**
(ii) Explain the effect of temperature on the impact energy **(6)**
OR
- 15b (i)** Explain the different mechanisms of plastic deformation **(6)**
(ii) With the characteristic curve , explain the creep deformation mechanism **(10)**