



B.E/B.Tech (Full-Time) DEGREE END SEMESTER EXAMINATIONS, APRIL/MAY 2012  
**MECHANICAL ENGINEERING BRANCH**  
FOURTH SEMSTER-REGULATION 2008

13

**ME 9252 ENGINEERING MATERIALS AND METALLURGY**

Time: 3Hr

Max.Mark:100

Answer ALL Questions

**Part –A (10x2=20 Marks)**

1. Differentiate between Solid solution and Intermetallic compound.
2. State the significance of  $A_{Cm}$  line in Iron –Iron carbide diagram.
3. Why hardness of coarse pearlite is less than fine pearlite?
4. How Nitriding is different from rest of the case hardening processes.
5. Why grey cast iron has poor impact strength?
6. How Nickel base alloys are classified?
7. What is the difference between thermoplastic and thermosetting plastic?
8. Name any two applications of Nanomaterials.
9. Sketch 'Screw' and 'Edge' dislocation
10. What are the characteristics feature of fatigue fracture?.

**Part – B (5x16 = 80 Marks)**

- 11 (i) Brief on the classification of composites based on matrix, their properties and applications (10 Marks) 16
- (ii) What are the characteristics of alumina?.State its applications.(6 Marks)
- 12a (i) Draw Iron –Iron carbide diagram label all the regions in it and brief on various invariant reactions. (12 Marks) 16
- (ii) Comment on the microstructure evolved by the slow cooling of steel containing 0.6% C from austenitic temperature. (4 Marks)
- (OR)
- 12b (i) Lead melts at 327°C and Tin melts at 233°C.They form a eutectic containing 62 percent tin at 183 °C.The maximum solid solubility of tin in lead at this temperature is 19 percent, of lead in tin 3 percent. Assume the solubility of each at room temperature is 1 percent. Draw the equilibrium diagram to scale on a graph paper labeling all points, lines and areas. ( 8 Marks) 16
- (ii) Describe the solidification of a 40 percent tin alloy. Sketch its microstructure at room temperature, giving the chemical composition and relative amount of phases present.(8 Marks)
- 13a How are T-T-T curves developed? Explain the phase change indicated by various cooling curves on the T-T-T diagram for eutectoid steel. 16

(OR)

- 13b Brief on the following case hardening techniques 16  
(i) Induction hardening  
(ii) Carbonitriding  
(iii) Nitriding  
(iv) Cyaniding ( Each 4 Marks)
- 14a (i) Summarise the effects of the following elements as alloying additions to the steel : Silicon, Chromium, Molybdenum, Vanadium (8 Marks) 16  
(ii) State the composition, properties and typical applications of any two stainless steel ( 8 Marks)
- (OR)
- 14b (i) What is meant by age hardening? Explain the process of precipitation hardening treatment for the Al-4% Cu alloy system. ( 8 Marks) 16  
(ii) State the composition, properties and typical applications of Brass and Bronze (8 Marks)
- 15a (i) Explain the various strengthening mechanisms (10 Marks) 16  
(ii) Differentiate between Izod and Charpy test (6 Marks)  
(OR)
- 15b (i) Draw a typical tensile test curve and brief on: Modulus of elasticity, Yield point, ultimate tensile strength, toughness and resilience. (10 Marks) 16  
  
Draw a typical creep curve and comment on the three regions of the curve. (6 Marks)