



B.E. / B.Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL– MAY 2014

MANUFACTURING ENGINEERING BRANCH

THIRD SEMESTER - (REGULATION 2012)

**ML8351 – ENGINEERING MATERIALS AND METALLURGY**

Time: 3 hr

Max. Mark: 100

**PART- A (10X2 = 20 Marks)**

1. What is the degree of freedom on  $A_1$  and Eutectoid point of Fe-FeC phase diagram?
2. Suppose metal A and B form solid solution and the pure melting point is  $T_A$  and  $T_B$ . If alloy has peritectic reaction at a temperature  $T_P$ , whether  $T_A > T_B > T_P$  is True or False. Justify.
3. Pick the odd man in the series and justify the selection: nitriding, carburizing, carbonitriding, induction hardening, flame hardening.
4. What is the typical microstructure of austempering processed steel?
5. What is the property and application of Elinvar steel?
6. Why sudden cooling is followed in casting of Al-Si alloys?
7. Why ceramics are brittle in nature?
8. What is temperature for moulding of thermoplastics, is it glass transition temperature or melting point? Justify.
9. What are the two kinds of twins?
10. List an application which needs microhardness and nanohardness testing method.

**PART- B (5 X16 = 80 Marks)**

11. (i) Draw Iron–Iron Carbide equilibrium diagram, indicate the various regions, lines, invariant reactions and compositions. (8)  
(ii) Classify steel and cast iron and draw their typical microstructures. (8)
12. (a) With help of Continuous -Cooling-Transformation (CTT) diagram of eutectoid steel, brief on the microstructure and properties of the following heat treatment process: annealing, normalizing and quench hardening. (16)

(OR)

- (b) Brief on the following process in terms of process, properties and applications: (4X4)
- (i) Spheroidizing
  - (ii) Tempering
  - (iii) Liquid Carburizing
  - (iv) Induction hardening

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13. (a) Brief on any FOUR of the following on their typical composition, microstructure, properties and applications: (4X4)  
High strength low alloy steel, Ferritic Stainless steel, Heavy duty Tool steel, Malleable Cast Iron, Ni based super alloy, cupronickel, Al-Mg alloy and Bearing alloy.

(OR)

- (b) (i) Comment on any FIVE alloying on their role, solubility, effect on ferrite, austenite, carbide formation, tempering and their principal functions (10)  
(ii) Brief on any one type of alloy each of Titanium and Magnesium. (6)

14. (a). State the properties and applications of the following materials:

- (i) Partially stabilized Zirconia (or) Alumina (2+2)  
(ii) Silicon Nitride (or) Sialon (2+2)  
(iii) PEEK (or) PTFE (2+2)  
(iv) PMMA (or) ABS (2+2)

(OR)

- (b) (i) List the various of type of reinforcement in metal matrix, polymer matrix and ceramics matrix composites and examples for each, their applications and mechanisms responsible for enhancement of mechanical properties.

15. (a) (i) Brief on the mechanisms of fatigue failures. (8)  
(ii) Comment on the property determined and utility in designing of engineering components of the following: Compression, Shear, Tensile and Impact test. (2X4)

(OR)

- (b) (i) Brief on the mechanisms of creep with respect to temperature and stress. (8)  
(ii) Brief on the mechanism of plastic deformation in metals and the role of dislocations/ defects in crystals in plastic deformation. (8)