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B.E. / B.Tech. (Full Time) EXAMINATIONS, APRIL/MAY 2014
 MATERIALS SCIENCE AND ENGINEERING BRANCH
 FIFTH SEMESTER
ML 9304- HEAT TREATMENT OF METALS & ALLOYS
 REGULATION 2008

Time : 3 hrs

Max Mark: 100

Answer ALL Questions

Part – A (10 x 2 = 20 Marks)

1. What are the purposes of heat-treatment?
2. Why austenite to bainite transformation is referred to as intermediate transformation?
3. What is inherently fine-grained steel?
4. What is diffusion annealing?
5. Write down the principle of flame hardening process.
6. State Fick's first law of diffusion.
7. Draw the cooling curve for austempering process.
8. What are the various heating media used for heat treatment?
9. Low carbon steels are generally non- heat treatable. Why?
10. Write down the difference between black heart and white heart malleabilisation.

Part – B (5 x 16 = 80 Marks)

11. (i) Explain the microstructural changes on cooling from a temperature of 1000°C to room temperature for a 0.4% carbon-steel. Draw the respective microstructures. (10)
- (ii) Discuss the effect of i) carbon content, ii) interlamellar spacing and iii) presence of carbide forming elements on the kinetics of formation of austenite on heating. (6)
12. (a). Explain in detail the Jominy end quench test with neat sketch? Discuss the various factors that affect the hardenability.

(OR)

12. (b). (i). What is retained austenite? (2)
- (ii). Discuss the ways by which retained austenite can be measured. (7)
- (iii). Explain the various methods of elimination of retained austenite. (7)

13. (a). (i). What is the basic principle of the carburising process? (2)
(ii). What are the advantages and limitations of the carburising process over other Case hardening treatments? (2)
(iii). Explain the three main types of carburising processes in detail. (14)

(OR)

13. (b). (i). What is the mechanism of nitriding process. (3)
(ii). What is the effect of microstructure on nitriding process? (3)
(iii). Describe the methods of ion nitriding and nitro-carburising. (10)

14. (a). Explain in detail the different stages of quenching.

(OR)

14. (b). (i). List the various furnaces used for heat treatment. (2)
(ii). Describe in detail about the fluidised bed furnaces and cryo chambers used for heat treatment. (14)

15. (a). (i). What is graphitisation? (2)
(ii). The ends of graphite flakes in grey cast iron acts as stress raisers. How this problem can be overcome? (4)
(iii). Discuss about the heat treatment of plain carbon steels. (10)

(OR)

15. (b). Discuss in detail the heat treatment of (2x8)
(i). Aluminium alloys
(ii). Spheroidal graphite iron.
