B.E. DEGREE (Full Time) ARREAR EXAMINATIONS, NOV / DEC 2024

MATERIALS SCIENCE AND ENGINEERING BRANCH

(REGULATIONS 2019)

ML 5404– HEAT TREATMENT OF METALS & ALLOYS

Time : 3 hrs

Max Marks: 100

Answer ALL Questions

Part – A (10 x 2 = 20 Marks)

1. Why austenite to bainite transformation is referred to as intermediate transformation?
2. Amount of retained austenite is high in high carbon steels and high alloy steels. Comment.
3. Name any two elements which are responsible for Temper Embrittlement in steels.
4. What are the ways by which retained austenite can be eliminated in hardened steel?
5. State Fick's law of Diffusion.
6. How does the white layer in Nitrided steel affect the mechanical properties?
7. Enumerate the salient features of "Lift-off Cover" furnace.
8. How does the effectiveness of oil depend on its viscosity, specific heat and latent heat of vapourisation?
9. What is the mechanism of increased hardness in precipitation hardenable stainless steels?
10. Welded austenitic stainless steels, if heated to 1050 -1100°C and quenched, do not show weld decay. Why?

Part – B (5 x 13 = 65 Marks)

11. a. 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.

(OR)

11.b. Draw the Time Temperature Transformation curve for Eutectoid steel and superimpose the CCT curves on the TTT diagram.

12. a. Describe the Jominy end-quench method of determining hardenability with neat sketches.

(OR)

12. b. Describe the structural changes that take place during tempering.

13. a. With a neat schematic diagram, illustrate the principles of progressive flame hardening and progressive spin hardening.

(OR)

13. b. Describe the methods of ion nitriding and nitro-carburising

14. a. Discuss in detail the various quenching media used in heat treatment technology.

(OR)

14. b. With suitable diagrams, discuss the basic principle and operation of the temperature measuring devices.

15. a. Describe about the heat treatment processes carried out for the manufacture of Malleable cast iron.

(OR)

15. b. Describe about the heat treatment processes carried out for the manufacture of Gray cast iron and Spheroidal Graphite iron.

PART – C (1 x 15 = 15 Marks)

16. a. Suggest a suitable material and subsequent heat treatment for an automobile chassis that should withstand the impact loading as well as should have sufficient hardness on the outer surface. Explain the heat treatment process with a neat thermal cycle diagram.

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