

August 2021

HEAT TREATMENT TECHNOLOGY*Time Allowed: 1.5 Hours**Full Marks: 70***Answer to Question No. 1 is compulsory and Answer any two questions from the rest.**

1. Answer the following questions (any twenty): 2x20
- i) Heat Treatment = Heating + _____ + Cooling. (Soaking/Holding)
 - ii) What is Crystal structure of Martensite?
 - iii) Austenite to Pearlite is _____ Controlled Transformation.
 - iv) For TTT curve above 55^oC Incubation time _____ (Decreases/Increases) with increase in undercooling.
 - v) What is Annealing Temperature Range in Hypo Eutectoid Steel?
 - vi) Normalized Structure is _____ (Finer/Coarser) Grain than Annealed Structure.
 - vii) Which Heat Treatment gives Martensite structure in Steel?
 - viii) Tempering is done _____ (Below/Above) A1 Temperature Line.
 - ix) Chances of Distortion & Cracking is minimum in _____ (Oil/Water) quenching.
 - x) The Purpose of Annealing is to reduce _____ (Brittleness/Ductility).
 - xi) The Purpose of Tempering is to increase _____ (Hardness/Ductility).
 - xii) Final Microstructure after Austempering is _____.
 - xiii) Final Microstructure after Patenting is _____.
 - xiv) Carburizing is done for High Carbon Steel – (True/False).
 - xv) Pack Carburizing is a _____ (Solid/Liquid/Gas) state Carburizing.
 - xvi) Induction Hardening is _____ Hardening Treatment.
 - xvii) Which type of Flame is mostly used for Flame hardening Treatment?
 - xviii) Nitriding of Steel is done _____ (Ferritic/Austenitic) Region in Fe-C Diagram.
 - xix) What is the Carburizing temperature?
 - xx) Continuous Type Furnace is best suitable for Mass Production. (True/False).
 - xxi) What is Hardening Temperature range in Hyper Eutectoid Steel?
 - xxii) Loss of Heat Energy is minimum in _____ (Oil/Electricity/Gas) Fired Furnace.
 - xxiii) Hardness of Steel increases with _____ (Increase/Decrease) in wt% Carbon.
 - xxiv) Mild Steel can be converted to High Carbon Steel by using which of the following process? a> Annealing, b> Normalizing, C> Case Hardening.
 - xxv) Fine Grains are obtained by _____ (Slow/Fast) Cooling
 - xxvi) Sub Zero Treatment is done to convert Retained Austenite to Martensite. (True/False)
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2. a) Differentiate between TTT & CCT Diagram. 7.5
 - b) Explain the Hardening Heat Treatment process of 0.6% Plain Carbon Steel. 7.5
 3. a) State by drawing Cooling curve to form Bainite Structure in Plain C & Alloy Steel. 7.5
 - b) Draw TTT curve of 0.8%C Steel. State the Effect of Alloying element on TTT Curve. 7.5
 4. a) State the Difference between Annealing & Normalizing. 7.5
 - b) Explain Flame Hardening of Steel. 7.5
 5. a) Explain Induction Hardening of steel. 7.5
 - b) How Austempering is done for Steel? 7.5
 6. a) Explain Cyaniding of Steel. 7.5
 - b) Explain Martempering of Steel. 7.5
 7. a) Explain different stages of Tempering of Steel. 7.5
 - b) Write Short Notes on: Soft Spot Defect. 7.5

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| 8. | a) | Write Short Notes on: Oxidation & Decarburization. | 7.5 |
| | b) | Write Short Notes on: Quench Crack. | 7.5 |
| 9. | a) | Write some differences between Batch type & Continuous type Furnaces. | 7.5 |
| | b) | Explain Salt Bath Furnace. What are its advantages? | 7.5 |
| 10. | a) | How Case Depth Measurement is done for Steel?-Explain. | 7.5 |
| | b) | Write Short notes on commercially available atmosphere for furnace atmosphere control. | 7.5 |
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