

Time: 3 Hour

Max. Marks: 80

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**N. B.**

- 1) Question No.1 is compulsory.
- 2) Attempt any three questions from remaining five questions.
- 3) All questions carry equal marks.
- 4) Figures to the right indicate full marks.
- 5) Answers to the questions should be grouped and written together.

- Q1. Write notes on any FOUR [20]
- (a) Critical Resolved Shear Stress (C.R.S.S.)
  - (b) Fracture toughness
  - (c) Tool steels
  - (d) Creep curve
  - (e) Shape Memory Alloys
- Q2. (a) Classify various types crystal defects? Discuss line defects and their types. [10]
- (b) Draw fully labeled neat sketch Fe-Fe<sub>3</sub>C equilibrium diagram. Also write invariant reactions in it. [10]
- Q3. (a) What is recrystallization annealing? Discuss the various stages of recrystallization annealing with neat sketch. [10]
- (b) What is Hardenability of steel? Explain Jominy End Quench test. [10]
- Q4. (a) What is the need of heat treatment process? Differentiate between annealing and normalizing process. [10]
- (b) Derive an expression for Griffith's theory of brittle materials failure. [10]
- Q5. (a) Explain induction hardening process with neat sketch. Also discuss its advantages, disadvantages and applications. [8]
- (b) Explain the processing of ceramics through injection moulding operation. [6]
- (c) Define nano materials. Discuss their applications. [6]
- Q6. (a) Classify composite materials? Discuss their properties and applications [8]
- (b) What is mean by endurance limit? Draw and discuss S-N curve for ferrous and non ferrous materials. [6]
- (c) What are smart materials? Explain any one in detail. [6]

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