Time: 3 Hour **Max. Marks: 80**

N. B.
1) Question No.1 is compulsory.
2) Attempt any three questions from the remaining five questions.
3) All questions carry equal marks.

Q1. Write notes on any FOUR [20]
(a) Edge dislocation defect in crystal
(b) Importance of iron as engineering material
(c) Retained austenite
(d) Fracture toughness
(e) Nano composites

Q2. (a) Classify various types of crystal defects? Discuss line defects and their types. . [10]
(b) Draw fully labelled neat sketch Fe-Fe_3C equilibrium diagram. Explain invariant reactions in it. [10]

Q3. (a) What is critical resolved shear stress? Derive its expression for deformation by slip. [8]
(b) Draw and explain Time Temperature Transformation (TTT) diagrams of 0.8%C alloy and label all important points and phases. [12]

Q4. (a) What is the induction hardening process? Discuss advantages, disadvantages and applications of it. [10]
(b) Derive an expression for Griffith's theory of brittle materials failure. [10]

Q5. (a) What is Hardenability? Explain Jominy End Quench test. [8]
(b) Explain the processing of ceramics materials through injection moulding operation. [7]
(c) Define Shape Memory Alloys (SPA). Discuss their properties and applications. [5]

Q6. (a) Define creep. Draw a classical creep curve and explain its each stage. [6]
(b) Discuss the working principle of an ultrasonic testing machine with a neat sketch. [8]
(c) Define nano technology? Discuss its applications in various fields. [6]

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