

(3 Hours)

[ Total Marks : 100

**N.B. :** (1) Question No. 1 is **compulsory**.(2) Attempt any **four** questions from remaining **six** questions.(3) **Figures** to the **right** indicate **full** marks.(4) Illustrate the answer with neat **sketches** wherever **required**.(5) Answers to questions should be **grouped** and **written together**.

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|--------|--|----|
| 1. (a) | Discuss the Normalizing heat treatment process of Steel.   | 6  |
|        | What is the purpose of Normalizing?  | 2  |
|        | Give some applications of Normalizing Process.   | 2  |
| (b)    | Define Fracture and give a brief classification of fracture.   | 3  |
|        | State Griffith's theory of brittle fracture and derive Griffith's equation.  | 7  |
| 2. (a) | Define lattice defect and state causes of their formation.   | 4  |
|        | Discuss the defects due to dislocation.  | 6  |
| (b)    | Explain the purpose and process of tempering heat treatment.   | 4  |
|        | Explain different types of tempering process.  | 6  |
| 3. (a) | State and explain Slip mechanism of plastic deformation.   | 4  |
|        | What is Critical Resolved Shear Stress?  | 2  |
|        | Derive the expression for Critical Resolved Shear Stress for deformation by slip.                                    | 4  |
| (b)    | What is Diffusion Coating?   | 2  |
|        | Name its different methods.  | 2  |
|        | Discuss any one process of diffusion coating in details on basis of principle, process, advantages and applications. | 6  |
| 4. (a) | Draw neat Iron- Iron Carbide Equilibrium diagram indicating all important temperature, phases and composition.       | 10 |
| (b)    | What is Nitriding?   | 2  |
|        | Explain the types of Nitriding Processes.  | 6  |
|        | Explain the heat treatment before Nitriding.   | 2  |
| 5. (a) | Write a note on Fatigue failure.   | 4  |
|        | Explain thermal fatigue and corrosion fatigue.   | 6  |
| (b)    | Explain the various transformations in Iron – Iron Carbide Equilibrium diagram.                                      | 10 |
| 6. (a) | Draw and explain each stage of a Creep Curve.  | 5  |
|        | Explain Andrade's analysis of the classical creep curve.   | 5  |
| (b)    | What are Stainless Steels?   | 2  |
|        | Explain different types of Stainless Steels.   | 8  |
| 7.     | Write short notes on:( <b>Any four</b> )   | 20 |
| (a)    | Retained Austenite   |    |
| (b)    | Ausforming Heat Treatment Process  |    |
| (c)    | Dispersion Hardening   |    |
| (d)    | Differentiate between Hot Working and Cold Working   |    |
| (e)    | Effect of alloying elements on Tempering   |    |
| (f)    | The Solid Solution   |    |