

Time: 3 Hours

Branch : Mech

Total Marks: 80

N. B : (1) Question no.1 is **Compulsory**.(2) Attempt **ANY THREE** questions from remaining five questions.

(3) Use illustrative diagrams wherever possible.

(4) Assume suitable data if necessary and mention it clearly.

- Q.1 Answer **Any Four** questions from the following :
- Explain Tempering heat treatment and its different types. 5
 - Define Ceramics and explain its advantages, disadvantages & applications in brief 5
 - Classify Engineering materials & write various important mechanical properties of engineering materials. 5
 - What are the types of smart materials? Explain any one smart material and its applications. 5
 - Draw the typical cooling curves for pure metal and binary solid solution alloy and explain its various regions. 5
- Q.2 (a) State & explain Griffith's theory of brittle fracture with mathematical derivation. 10
- (b) What is Cold working of metals? Why is Recrystallization Annealing necessary after cold working? Discuss the various stages of Recrystallization Annealing with neat sketch. 10
- Q.3 (a) Classify various crystal defects and explain any one type of crystal defect with neat sketches. 10
- (b) Discuss the process, purpose, microstructure change of the following heat treatment and show temperature range in Fe-Fe₃C equilibrium diagram (**Any One**): 06
- Hardening
 - Normalizing
- (c) Differentiate between Destructive and Non-destructive testing of materials with examples. 04
- Q.4 (a) Draw neat Iron-Carbon Equilibrium diagram and label all important temperatures, compositions and phases clearly. Write Eutectic and Eutectoid, Peritectic reactions with reference to this diagram. 08
- (b) Explain Induction hardening process with a neat sketch. How it is different from flame hardening? 06
- (c) Define and classify 'Composite'. Write application & advantages of composite over metallic materials. 06
- Q.5 (a) What do you mean by nano materials? Write typical examples and applications of nano materials. 06
- (b) What do you mean by Stainless steel? Give brief of classification of stainless steels. 04
- (c) What is Nondestructive testing of material and explain Any One type of following Nondestructive testing in detail with diagram. 10
- Ultrasonic testing
 - Radiographic testing
- Q.6 (a) Differentiate between Hardness and Hardenability. Explain Jominy End Quench test to determine hardenability by using suitable sketches. 10
- (b) Explain Creep testing with neat sketch. Draw 'Creep Curve' and explain each stage in detail 10
