

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech Summer 2022 – 23 Examination

Semester: 4th
Subject Code: 203113251
Subject Name: Engineering Materials and Metallurgy

Date: 27/03/2023
Time: 2.00 pm to 4.30 pm
Total Marks: 60

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - (All are compulsory) (Each of one mark) (15)

1. Mild steel belongs to following category
(a) Low carbon steel (b) Medium carbon steel (c) High carbon steel (d) Alloy steel
2. An eutectoid steel consists of
(a) Wholly Pearlite (b) Wholly austenite (c) Pearlite and Ferrite (d) Pearlite and Cementite
3. The following type of materials are usually most ductile
(a) FCC Lattice (b) BCC lattice (c) HCP lattice
4. The heat treatment process used for softening hardened steel is
(a) Carburising (b) Normalising (c) Annealing (d) Tempering.
5. Gibbs phase rule for general system is
(a) $P+F=C-1$ (b) $P+F=C+1$ (c) $P+F=C-2$ (d) $P+F=C+2$
6. The percentage of carbon in cast iron varies from _____
7. State Any four name of Case hardening Processes.
8. Distinguish Between Creep and Fatigue?
9. Mention two types of Dislocations?
10. Dye penetrant method is generally used to locate which type of defects?
11. What are the principal constituents of Brass?
12. Explain the difference between Pearlite and Cementite?
13. When a material is known as Allotropy or Polytropic?
14. Material after cold working is subjected to which heat treatment process to relieve stresses?
15. Classify Engineering Materials.

Q.2 Answer the following questions. (Attempt any three) (15)

- A) Define Powder Metallurgy. State advantages and limitations of Powder Metallurgy.
- B) Briefly explain Gibb's Phase rule.
- C) What are the purpose of Alloying? Give effects of nickel as an alloying element.
- D) What are the engineering requirements of materials? Explain in detail.

Q.3 A) What do you mean by Non-destructive testing? Differentiate destructive and non-destructive (07)

testing by stating benefits and limitations.

B) Define Heat treatment of metals. Explain with neat sketch TTT diagram for heat treatment of steel. (08)

OR

B) What is a substitutional solid solution? Explain the Hume Rothery rule for the formation of a substitutional solid solution. (08)

Q.4 A) Explain in detail, the Ultrasonic Testing method with its benefits and limitations. (07)

OR

A) What is strain hardening? Explain how the effect of strain hardening can be eliminated by recrystallization? (07)

B) Draw & Explain Iron-Iron Carbide Diagram with all regions. (08)