

MATERIAL SCIENCE & ENGINEERING

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

PART – A

(Compulsory Question)

- 1 Answer the following: (10 X 02 = 20 Marks)
- What are the three primary bonds in materials? Which is the strongest? Why?
 - State the Hume Rotherys rules.
 - Why the eutectic structure does not exhibit coring?
 - Apply phase rule to the two phase field of a binary isomorphous diagram. What conclusion can be drawn?
 - Which microstructure in eutectoid steel has maximum hardness? Give reason.
 - What is the purpose of Alloying steels?
 - Under what heat treatment condition an age harden-able alloy can be machined.
 - What is a TTT-diagram?
 - What are ceramic materials? Name some important ceramic materials.
 - What is meant by the term Elastomer?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

- 2 Name the four types of atomic bonds observed in materials. Describe them with examples.

OR

- 3 Discuss the effect of grain boundaries on the properties of metals and alloys.

UNIT – II

- 4 Sketch and explain binary phase diagram of Fe-Fe₃C.

OR

- 5 With the help of neat sketches explain the set of cooling curves obtained from thermal analysis of a simple binary eutectic system.

UNIT – III

- 6 State composition, properties and uses of carbon steels.

OR

- 7 What are the typical alloys of copper used in Engineering? Describe briefly their composition and uses.

UNIT – IV

- 8 Distinguish between:

- Hardness and hardenability of steel.
- Full annealing and process annealing.

OR

- 9 Enumerate various heat-treatment processes and explain any two of them briefly.

UNIT – V

- 10 (a) Explain briefly the Mechanical and Electrical properties of ceramic materials.
(b) Discuss how Glass is manufactured.

OR

- 11 (a) Differentiate between thermo plastics and thermo setting polymers.
(b) Discuss the importance of composite materials in Engineering Applications.