

B.Tech I Year II Semester (R15) Regular Examinations May/June 2016

**MATERIAL SCIENCE & ENGINEERING**

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

**PART – A**

(Compulsory Question)

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- 1 Answer the following: (10 X 02 = 20 Marks)
- (a) What are the three primary bonds in materials? Which is the strongest? Why?
  - (b) State the Hume Rotherys rules.
  - (c) Why the eutectic structure does not exhibit coring?
  - (d) Apply phase rule to the two phase field of a binary isomorphous diagram. What conclusion can be drawn?
  - (e) Which microstructure in eutectoid steel has maximum hardness? Give reason.
  - (f) What is the purpose of Alloying steels?
  - (g) Under what heat treatment condition an age harden-able alloy can be machined.
  - (h) What is a TTT-diagram?
  - (i) What are ceramic materials? Name some important ceramic materials.
  - (j) 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-Fe<sub>3</sub>C.

**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:

- (a) Hardness and hardenability of steel.
- (b) 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.

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