

B.Tech I Year II Semester (R15) Supplementary Examinations December 2018

**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)
- What are types of bonds in solids?
  - Why alloying is required in metals?
  - What do you know by Isomorphous alloy systems?
  - Sketch binary phase diagram of Fe-Fe<sub>3</sub>C and indicate all important points.
  - What are the properties and applications of grey cast Iron?
  - Write classification of steel. Give one example of each.
  - Write short notes on tempering process.
  - What is age hardening of metals?
  - Differentiate between particle and fiber reinforced materials.
  - What are the applications and properties of cermets?

**PART – B**

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

**UNIT – I**

- 2 (a) Take an edge dislocation and describe Burger's circuit and Burger's vector.  
(b) What do you understand by solid solution? What is the type of solid solution of Ni and Cu?

**OR**

- 3 (a) What type of solid solution exists between iron and carbon? Explain.  
(b) Discuss the grain boundaries and its effect on the properties of metals.

**UNIT – II**

- 4 (a) Discuss the binary phase diagram of Al-Cu system and apply lever rule.  
(b) Explain the following: (i) Coring miscibility gaps. (ii) Lever rule.

**OR**

- 5 (a) With help of an example in Cu-Ni phase diagram, explain the lever rule.  
(b) Draw the microstructure of 0.8% C steel at eutectoid temperature of 727°C.

**UNIT – III**

- 6 (a) Discuss the structure and properties of white cast iron.  
(b) Explain the structure and properties of Al and its alloys.

**OR**

- 7 (a) What is spheroidal graphite cast iron? Write its applications.  
(b) Explain the properties and applications Ti and its alloys.

**UNIT – IV**

- 8 (a) Explain the heat treatment of plastics.  
(b) Explain any one of the TTT diagram and indicate all points.

**OR**

- 9 (a) Explain the principle of cryogenic treatment of alloys.  
(b) Discuss the following: (i) Annealing. (ii) Normalizing with an example.

**UNIT – V**

- 10 (a) What are types of composites? Classify and write advantages of composites over metals.  
(b) What are metal matrix composites? Where are they used?

**OR**

- 11 (a) What are laminar composites and sandwich panels? What are their applications?  
(b) Sketch and explain the crystalline structure of glasses.