

**R13**

Code No: 113AQ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, March - 2017

METALLURGY AND MATERIALS SCIENCE

(Common to AME, ME, MCT)

Time: 3 Hours

Max. Marks: 75

**Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

**PART - A****(25 Marks)**

- 1.a) What is electron compound? Give examples [2]
- b) What is congruent melting intermediate phase? [3]
- c) Define allotropy and give examples. [2]
- d) Differentiate between spheroidal graphite cast Iron and gray cast Iron. [3]
- e) Differentiate between hardness and hardenability. [2]
- f) What are  $\alpha$ -Stabilizers in titanium alloys. [3]
- g) Differentiate between crystallized ceramics and cermets. [2]
- h) What is the role of grain boundaries on the properties of metal % Alloys. [3]
- i) What is Lever rule? [2]
- j) What is pendulum annealing? [3]

**PART - B****(50 Marks)**

- 2.a) State Hume-Rothery's rules for the formation of substitutional solid solutions. [5+5]
  - b) Differential between metal and alloy. [5+5]
- OR**
- 3.a) What is the necessity of Alloying? [3+3+4]
  - b) Distinguish between Intermetallic compound and Electron compound. [3+3+4]
  - c) Differentiate between grain and atom. [3+3+4]
4. Draw the Fe-Fe<sub>3</sub>C Diagram and label all the points, lines, temperatures and reactions. [10]
- OR**
- 5.a) Apply the Lever rule to phase equilibrium in an alloy of 15% B and 85% A when a liquid of 45% B is in equilibrium with a solid solution of 95% A. [5+5]
  - b) What is Isomorphous alloy system? Explain with suitable example. [5+5]
- 6.a) Gray cast Iron is brittle, in spite of having soft phase (i.e.) Ferrite and graphite in its micro structure, Explain with suitable reason. [5+5]
  - b) Differentiate between white cast iron and malleable cast iron. [5+5]
- OR**
7. Draw the C-curves for 0.8% C steel and explain the phase transformations that occur on different cooling rates. [10]

8. Describe the composition, heat treatment and applications of the following metals:  
a) copper and its Alloys  
b) Titanium and its alloys [5+5]

OR

9. Explain how a TTT diagrams is constructed? What is its relation to CCT diagrams?  
Draw a TTT diagram for 0.4%C steel and identify the microstructural phases. [10]

10. Write short notes on  
a) Metal Matrix composites  
b) Fibber reinforced composites. [5+5]

OR

11. Enumerate the characteristics, properties and applications of composites and polymers. [10]

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