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Code No: 123A0

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**B.Tech II Year I Semester Examinations, March - 2017****METALLURGY AND MATERIALS SCIENCE****(Common to 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) Differentiate between crystal structure and microstructure. [2]
- b) Determine the density of BCC iron, which has a lattice parameter of 0.2866nm and atomic mass of 55.847 g/mol. [3]
- c) What is peritectic reaction? Explain with an example. [2]
- d) Explain Lever Rule with an example. [3]
- e) What is hardenability? [2]
- f) What are the applications of TTT diagrams? [3]
- g) What is malleable cast iron? Explain its important properties. [2]
- h) Write the properties of Al? [3]
- i) What are crystalline ceramics? Give at least two examples. [2]
- j) Explain the cermets with examples. [3]

PART-B**(50 Marks)**

2. Discuss Hume-Rothery rules for the formation of substitutional solid solutions. [10]
- OR**
3. Write short notes on intermediate alloy phases and electron compounds. [10]
- 4.a) Correlate the cooling behavior of pure metals and eutectic alloys.
 - b) Write a brief note on electron compounds. [5+5]
- OR**
5. Metal A melts at 324⁰C and metal B melts at 230⁰C. They form eutectic compound with 62% B at 180⁰C. The maximum solubility of B in A at this temperature is 19% and A in B is 3%. Assuming the solubility of each at room temperature 1.0%,
 - a) Draw the equilibrium diagram and label all the points, lines and areas.
 - b) Describe the solidification of 40%B alloy and draw its microstructure.
 - c) Draw the cooling curve of 40%B alloy. [10]
 6. Explain the heat treatment of hadfield manganese steels. [10]
- OR**
7. Construct the TTT curves for 0.4%C steel and explain the phase changes occur while cooling from austenitic temperature to room temperature at different cooling rates. [10]

8. Write short notes on the following:
a) Characteristics of martensite
b) Properties and composition of cartridge Brass. [5+5]

OR

9.a) Explain the properties and application of Duralumin.
b) Draw the phase diagram of Al-cu system and explain the age-hardening behavior. [5+5]

10. Write short notes on the following:
a) Ceramic composites.
b) Fiber reinforced composites. [5+5]

OR

11. Differentiate between Metals, Polymers and Ceramics and explain their suitability as matrix materials in composites. [10]

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