

Code No: 53018

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****B.Tech II Year I Semester Examinations, February/March - 2016****METALLURGY AND MATERIAL SCIENCE****(Common to ME, AME)****Time: 3 hours****Max. Marks: 75****Answer any five questions  
All questions carry equal marks**

---

- 1.a) Explain the importance of grain and grain boundaries on the mechanical properties of an alloy.  
b) What are the different types of bonds? Explain with an example for each. [8+7]
2. Write short notes on the following:  
a) Hume Rothery rules  
b) Solid solutions. [8+7]
3. Metal 'A' melts at  $324^{\circ}\text{C}$  and metal 'B' melts at  $230^{\circ}\text{C}$ . They form eutectic containing 62% B at  $180^{\circ}\text{C}$ . The maximum solubility of B in A at this temperature is 19% and that of A in B is 3%. Assuming the solubility of each at room temperature is 1%.  
a) Draw the equilibrium diagram of A-B 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. [5+5+5]
- 4.a) Differentiate between hardening and hardenability.  
b) Explain about Jominey-end quench test.  
c) Draw the microstructure, properties and applications of spheroidal graphite iron. [5+5+5]
5. Draw TTT diagram for eutectoid steel and explain the phase transformation at different cooling rates when it is cooled from austenitic region to room temperature. [15]
6. Write short notes on:  
a) Titanium alloys  
b) Aluminium alloys. [7+8]
- 7.a) What are ceramics? Explain the classification of ceramics.  
b) Write short notes on abrasive materials. [8+7]
- 8.a) List the various properties of Carbon-Carbon (C-C) composites.  
b) Enlist the uses of C-C composites.  
c) Discuss the uses of Glass Fiber Reinforced Plastic (GFRP). [5+5+5]