

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE - SEMESTER– III (NEW) EXAMINATION – SUMMER 2015**

**Subject Code:2131904****Date:02/06/2015****Subject Name: Material Science and Metallurgy****Time: 02.30pm-05.00pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a) What are the engineering requirements of materials? Explain in detail. **07**  
(b) Explain Structure Property and Performance relationships with a suitable example. **07**

- Q.2 (a) Differentiate under-cooling and constitutional super-cooling in context of solidification and its effect on final structure. **07**  
(b) What are the various levels of structure? Explain in detail. **07**

**OR**

- (b) Explain homogenous and heterogeneous nucleation with neat sketches. **07**

- Q.3 (a) What is strain hardening ? Explain how the effect of strain hardening can be eliminated by recrystallization? **07**  
(b) Explain the three basic zones formed after solidification of alloys. **07**

**OR**

- Q.3 (a) What are the various methods of controlling grain structure during solidification? Explain in detail. **07**  
(b) What is Gibbs Phase Rule ? Clearly explain all variables ? **07**

- Q.4 (a) Explain substitutional solid solution and Hume Rothery Rule for the feasibility of it. **07**  
(b) Draw a neat and labeled Iron-Iron Carbide diagram and explain eutectic and eutectoid reaction in it. **07**

**OR**

- Q.4 (a) What is substitutional and interstitial solid solution. Why solubility of solute is limited in interstitial solid solution? Justify. **07**  
(b) What is plain carbon steel? Also explain all type of plain carbon steel with the composition and specific application. **07**

- Q.5 (a) Explain the property requirement from a bearing material. Explain journal bearing material in detail. **07**  
(b) Draw and label TTT diagram for eutectoid steel and show annealing and normalizing in it. Explain the critical cooling rate with the help of TTT diagram. **07**

**OR**

- Q.5 (a) Explain the requirements of metal powders used in powder metallurgy. Also explain various methods of powder production. **07**  
(b) Explain the steps of Dye Penetrant Testing with neat sketch **07**

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