Seat No.: _____ Enrolment No._____

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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