Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III EXAMINATION – WINTER 2015

Subject Code:131904 **Date:07/01/2016**

Subject Name: Material Science & Metallurgy

Time: 2:30pm to 5:00pm **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)**	Why is the study of Engineering Materials and Metallurgy necessary for Mechanical Engineers?	**07**
	(b)	Draw and explain iron-iron carbide equilibrium diagram with all necessary details.	**07**
Q.2	**(a)**	Discuss importance of Heat Treatment process. Compare Annealing and Normalizing process as regard to their objectives, merits, limitations and applications.	**07**
	(b)	Explain the Spark Test and Magnetic Test for metallic materials.	**07**
		OR	
	(b)	Compare cooling curves for pure metal, isomorphous and non-isomorphous alloys. State the information revealed by these cooling curves.	**07**
Q.3	**(a)**	Draw the microstructure of wrought iron and discuss composition, properties and uses of wrought iron.	**07**
	(b)	Enlist Case hardening process. Discuss any one in detail.	**07**
		OR	
Q.3	**(a)**	Give composition, properties and uses of malleable cast iron.	**07**
	(b)	State function of following alloying elements in steel. i. Nickel, ii. Chromium, iii. Sulphur, iv. Molybdenum, v. Vanadium.	**07**
Q.4	**(a)**	Discuss the properties of pure Aluminum. Enlist Aluminum alloys and explain any one Aluminum alloy in detail with composition, properties and applications.	**07**
	(b)	Define 'Corrosion' and describe different types of corrosion. Also discuss common methods to protect corrosion.	**07**
		OR	
Q.4	**(a)**	Discuss the properties of pure Copper. Enlist Copper alloys; explain any one Copper alloy in detail with composition, properties and applications.	**07**
	(b)	Explain the mechanism of electrochemical corrosion.	**07**
Q.5	**(a)**	What is powder metallurgy? Describe methods of manufacturing metal powder briefly.	**07**
	(b)	What is non destructive test? Explain X-Ray radiography test in detail.	**07**
		OR	
Q.5	**(a)**	Discuss steps of Powder Metallurgy process in detail. Also state advantages, limitations and applications of Powder Metallurgy.	**07**
	(b)	Suggest and explain NDT method to determine minute surface defects in large size component.	**07**

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