Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE SEM-III Examination May 2012

Subject code: 131904

Subject Name: Material Science & Metallurgy

Date: 15/05/2012 **Time: 02.30 pm – 05.00 pm**

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 is Gibb's phase rule? Explain its importance.	**5**
	(b)	Draw microstructure of (i) 04 % carbon steel and (ii) eutectoid steel at room temperature.	**5**
	(c)	Draw iron – iron carbide equilibrium diagram with all necessary details. Briefly explain cooling of 1.2 % carbon steel from liquid state to room temperature.	**4**
Q.2	**(a)**	Discuss the advantages, disadvantages and limitations of powder metallurgy.	**07**
	(b)	Describe with neat sketch how would you carry out a Jominy harden ability test on a steel sample.	**07**
		OR	
	(b)	i. Briefly explain why ferritic and austenitic stainless steels are not heat treatable. ii. Distinguish between hardness and harden ability	**07**
Q.3	**(a)**	Draw TTT diagram for eutectoid steel. Explain it briefly by considering few cooling rates.	**5**
	(b)	Differentiate between austempering and martempering.	**5**
	(c)	Case carburizing heat treatment is not generally carried out for medium carbon steels. Why?	**4**
		OR	
Q.3	**(a)**	Explain allotropic transformation of iron.	**5**
	(b)	What is solid solution? Discuss in brief types of solid solution with neat sketch.	**5**
	(c)	What are the factors affecting hardnability?	**4**

Q.4	**(a)**	What is cooling curve? How does the time temperature cooling curve of an alloy of eutectic composition different from that of a pure metal?	**5**
	(b)	Explain with neat sketches the arrangement of atoms in B.C.C, F.C.C. and H.C.P. lattice. Define unit cell. Show that a F.C.C. structure is always more close packed than B.C.C. structure.	**5**
	(c)	Explain use of Galvanic series	**4**

OR

Q.4	**(a)**	Explain with neat sketches steps involved in preparing specimen for microscopic examination.	**5**
	(b)	Enlist methods of manufacturing metal powder. Discuss any one in detail.	**5**
	(c)	Explain modified aluminum silicon alloys.	**4**
Q.5	**(a)**	How will you classify brasses based on the composition of zinc Explain the properties & application of the main type of brasses.	**5**
	(b)	Explain Cathodic protection against corrosion.	**5**
	(c)	Enlist properties of a good bearing material.	**4**

OR

Q.5	**(a)**	Enlist different method of metal coating for corrosion prevention. Discuss any one in detail.	**5**
	(b)	Classify types of cast iron. Discuss any on. Draw its microstructure also.	**5**
	(c)	Explain flame-hardening process in brief	**4**

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