Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. Sem-III Regular / Remedial Examination December 2010

Subject code: 131904

Subject Name: Material Science and Metallurgy

Date: 14 /12 /2010 **Time: 10.30 am – 01.00 pm**

Total Marks: 70

Instructions:

1. **Read questions carefully and diligently.**
2. **Be very specific and precise while answering the questions.**
3. **Don't write irrelevant explanations.**
4. **Attempt all questions and Figures to the right indicate full marks.**

Q.1 **(a)** 1. Name at least one application of following engineering properties of material. **05**
(i) Hardness (ii) Toughness (iii) Creep Strength (iv) Plasticity (v) Stiffness
2. What is modulus of elasticity? Draw stress strain diagram for Mild Steel and Cementite. **03**

(b) State Critical Reactions of Iron Carbon Phase diagram. **06**

Q.2 **(a)** 1. Say at point "Q" in (Liquid+Solid) region in a phase diagram, a line passing through point "Q" and parallel to the base is drawn. The line intersects the liquidus and solidus at points P and R respectively. Can you determine %Solid at point Q if PR is 6 cm and QR is 2.4 cm in length? If answer is YES, determine % Solid and if NO, justify your answer. **04**
2. Draw the three most commonly observed space lattices in Metals. **03**

(b) 1. Write full names of following acronyms: BHN ; AISI ; ASTM ; TTT **04**
2. What is the significance of Liquidus, Solidus and Solvus line in phase diagram? **03**

OR

(b) 1. What is coring? Why it is observed? **04**
2. Draw cooling curve of (i) pure metal and (ii) An alloy of two metals which are completely soluble in liquid and solid phase. **03**

Q.3 **(a)** 1. State the difference between impurities and alloying elements. State importance of alloying. **04**
2. What is metallography? What useful information can be obtained from it? **04**

(b) Specify, with reasons alloy suitable for the manufacture of : **06**
Bolts and Nuts ; Lathe Bed ; Milling Cutter

OR

Q.3 **(a)** 1. State function of following alloying elements in steel : **04**
Sulphur ; Nickel ; Chromium ; Boron
2. What is micro examination of metal? What are the various steps required for such an examination? **04**

(b) State composition and specific applications of : **06**
Muntz metal ; German silver ; Naval brass

Q.4 **(a)** Differentiate Annealing and Normalising on the basis of **06**
(i) Rate of Cooling (ii) Microstructure after cooling (iii) Grain size distribution
(iv) Internal Stresses (v) Mechanical properties and (vi) Applications.

(b) 1. Draw microstructure of eutectoid steel. **04**
2. Explain in brief: Factors affecting formation of solid solution **04**

OR

Q.4	**(a)**	It is required to obtain very thin hardened surfaces on gears of automobiles. Suggest suitable methods with salient features.	**06**
	(b)	1. Draw microstructure of eutectic cast iron.	**04**
		2. State effect of grain size on mechanical properties of material.	**04**
Q.5	**(a)**	Explain the NDT method widely used for inspection of castings.	**06**
	(b)	1. Explain in brief: Sintering Process	**04**
		2. State and explain principle of cathodic protection.	**04**

OR

Q.5	**(a)**	Define Powder Metallurgy. State advantages, limitations and applications of Powder Metallurgy.	**06**
	(b)	1. Suggest and explain a simple and economical NDT method to determine minute surface defects in large size component.	**04**
		2. Write short note on Metallic coatings.	**04**

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