Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (New) EXAMINATION – WINTER 2015

Subject Code:2131904 **Date:23/12/2015**

Subject Name: Material science and 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.**

MARKS

Q.1 Short Questions **14**

1 Gibbs phase rule for general system is_____.
(a) P+F=C-1 (b) P+F=C+1 (c) P+F=C-2 (d) P+F=C+2

2 Relative amounts of phases in a region can be deduced using (a) Phase rule (b) Lever rule (c) Either (d) None

3 Repeatable entity of crystal structure is known as _____
(a) Crystal (b) lattice (c) unit cell (d) Miller indices

4 A dislocation in metal represents _____.
(a) Weakness of metal (b) Point defect in metal
(c) Line defect in metal (d) Volume defect in metal

5 Eutectoid mixture of steel is _____
(a) a mixture of ferrite and cementite
(b) a mixture of ferrite and austenite
(c) a mixture of austenite and cementite
(d) called pearlite

6 The reaction that yields two solid phases on cooling single solid phase is called _____.
(a)eutectoid (b) peritectoid (c)eutectic (d) congruent

7 The following type of material are usually most ductile
(a) FCC Lattice (b) BCC lattice (c) HCP lattice

8 Material after cold working is subjected to following process to relieve stresses.
(a) hot working (b) tempering (c) annealing

9 Higher the temperature of tempering, the product will be _____
(a) softer (b) tougher (c) harder (d) stronger

10 Mild steel belongs to following category
(a) low carbon steel (b) Medium carbon steel
(c) High carbon steel (d) alloy steel

11 Steels are primarily designated according to _____
(a) carbon content (b) alloying element

12 Chromium added to iron improves
(a) fatigue resistance (b) corrosion resistance
(c) high temperature resistance (d) none

13 Dye penetrant method is generally used to locate
(a) temporary defect (b) superficial defect
(c) core defect (d) surface defect

	14	The percentage of carbon in cast iron varies from (a) 0.1 to 0.5 (b) 0.5 to 1 (c) 1.7 to 4.5 (d) 1 to 1.7	
Q.2	**(a)**	Explain the requirement of engineering materials.	**03**
	(b)	Explain imperfections in crystal with neat sketches.	**04**
	(c)	Compare cooling curves for pure metal, isomorphous and non-isomorphous alloys. State the information revealed by these cooling curves.	**07**
		OR	
	(c)	What do you mean by Micro and Macro examination of engineering metallic materials? How metallic specimen is prepared for optical microscopic examination	**07**
Q.3	**(a)**	Draw and explain microstructure of eutectoid steel.	**03**
	(b)	Differentiate between Annealing process and Normalizing process.	**04**
	(c)	Define Heat treatment of metals. Explain with neat sketch TTT diagram for heat treatment of steel.	**07**
		OR	
Q.3	**(a)**	What do you mean by allotropy of metal? Discuss allotropy of Iron.	**03**
	(b)	What are the purpose of Alloying ? Give effects of nickel as an alloying element	**04**
	(c)	Draw iron – iron carbide equilibrium diagram. Explain important phases in it. Discuss the phase transformation takes place for the 0.6 % carbon steel from liquid to room temperature.	**07**
Q.4	**(a)**	State the Qualities Required in Bearing Metals.	**03**
	(b)	Differentiate between white cast iron and grey cast iron.	**04**
	(c)	Enlist the products made from powder metallurgy. Explain all four steps of power metallurgy.	**07**
		OR	
Q.4	**(a)**	State composition and specific applications of : Muntz metal ; German silver ; Naval brass	**03**
	(b)	Enlist methods of manufacturing metal powder. Discuss any one in detail	**04**
	(c)	Classify different types of cast iron. Why silicon is added to cast iron? Explain the effects of any four alloying elements on the properties of cast iron	**07**
Q.5	**(a)**	Compare Destructive test with Non Destructive test	**03**
	(b)	What is nondestructive test? List various nondestructive tests. Explain advantages and Disadvantages of non-destructive tests.	**04**
	(c)	State Surface Hardening processes and explain any one	**07**
		OR	
Q.5	**(a)**	Explain Dye penetrant testing.	**03**
	(b)	What is metallography? What useful information can be obtained from it?	**04**
	(c)	Explain the method Ultrasonic Testing with neat sketch. And also explain its advantages and limitations.	**07**

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