

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
