

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-III (NEW) - EXAMINATION – SUMMER 2018

Subject Code:2131904

Date:23/05/2018

Subject Name:Material Science and Metallurgy

Time:10:30 AM to 01:00 PM

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	(a) Define the following material properties: i) Ductility ,ii) Creep and iii) Hardness	03
	(b) Differentiate between Polymers and Composite materials	04
	(c) Derive the expression for relationship between atomic radius and lattice parameter in Body Centered Cubic (BCC) Lattice. Find the effective number of atoms/unit cell, atomic packing factor and coordination number.	07
Q.2	(a) Molybdenum (Mo) has BCC structure and a density of $10.2 \times 10^3 \text{ kg/m}^3$. Calculate the lattice parameter and atomic radius. The atomic mass of Molybdenum is 95.94 gm/mol.	03
	(b) Differentiate between interstitial defects and substitutional defects.	04
	(c) List down the steps involved in evaluating the Miller indices for crystallographic planes. Find the miller indices for planes AECG and AFGD shown in Figure 1(a) and (b) respectively.	07

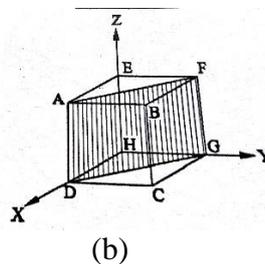
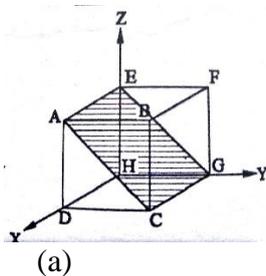


Figure 1

OR

	(c) Explain the procedure for establishing crystallographic directions in a cubic lattice. Also list down the features of crystallographic directions.	07
Q.3	(a) State the composition, properties and applications of Hindalium and Invar.	03
	(b) Explain the mechanism of twinning with a neat sketch.	04
	(c) What is a substitutional solid solution? Explain the Hume Rothery rule for the formation of a substitutional solid solution.	07
OR		
Q.3	(a) What is meant by coring?	03
	(b) What are the factors affecting microstructure of cast iron?	04
	(c) Draw the Iron-Iron Carbide equilibrium diagram and explain the eutectic, eutectoid and peritectic transformation.	07
Q.4	(a) Explain Heterogeneous nucleation.	03
	(b) Explain Pack Carburizing.	04

- (c) Explain the 'Lever rule' based on the phase diagram of binary alloy. **07**
- OR**
- Q.4** (a) Explain the significance of adding sulphur and chromium as alloying elements in steel **03**
(b) Explain Induction hardening **04**
(c) List down the merits and limitations of powder metallurgy **07**
- Q.5** (a) Explain the composition, properties and applications of Muntz metal **03**
(b) Explain any two mechanical process utilized for metal powder production **04**
(c) Describe magnetic particle testing with a neat sketch **07**
- OR**
- Q.5** (a) Differentiate between impregnation and infiltration **03**
(b) Explain the procedure of specimen preparation for microstructure examination **04**
(c) Explain Jominy Hardenability Test with a neat sketch **07**