Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:2131904 **Date:23/05/2018**

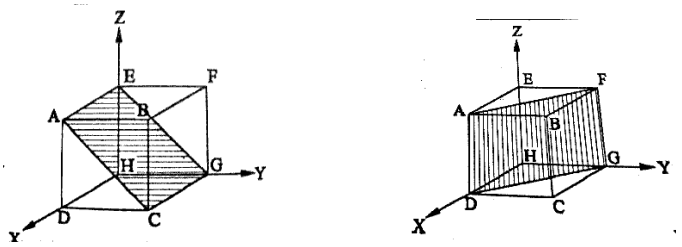
Subject Name:Material Science and Metallurgy

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 $10.2x10^3$ 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**



(a) (b)

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**