Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – SUMMER 2019

Subject Code: 2152106 **Date: 06/06/2019**

Subject Name:Physical Metallurgy

Time: 02:30 PM TO 05:00 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 crystal. List the crystal system.	**03**
	(b)	Draw miller indices planes and directions: (1 1 1), ($\bar{1}$ $\bar{1}$ 0), (1 2 3), [1 1 0], [1 2 3]	**04**
	(c)	Derive APF for FCC and BCC.	**07**
Q.2	**(a)**	What is Degree of freedom?	**03**
	(b)	What is heterogeneous nucleation?	**04**
	(c)	Derive the formula for critical radius for the nucleation.	**07**
		OR	
	(c)	Explain the Hume-Rothery rule for substitution solid solution.	**07**
Q.3	**(a)**	Explain allotropy of iron.	**03**
	(b)	Explain the Gibb's phase rule with suitable example for invariant system.	**04**
	(c)	Briefly explain mechanical mixture, intermediate phases and solid solutions.	**07**
		OR	
Q.3	**(a)**	With graph derive the formula for degree of supercooling.	**03**
	(b)	Briefly explain with the help of graph rate of growth and rate of nucleation.	**04**
	(c)	Draw and explain the cooling curve for pure metal, binary solid solution and binary eutectic system.	**07**
Q.4	**(a)**	Draw phase diagram for isomorphous system with example.	**03**
	(b)	Classify phase diagram based on solid solubility of components in solid and liquid state.	**04**
	(c)	With the help of cooling curve explain eutectic phase diagram construction with example.	**07**
		OR	
Q.4	**(a)**	What do you mean by coring?	**03**
	(b)	Give the reaction for eutectic, eutectoid, peritectic, peritectoid and monotectic.	**04**
	(c)	Draw, sketch and label Iron-Iron carbide equilibrium diagram. Explain various phases and transformation reactions.	**07**
Q.5	**(a)**	Why solid state is most stable at room temperature?	**03**
	(b)	What are different methods used for grain size measurement. Explain any one of it.	**04**
	(c)	What is Metallography? Explain briefly various steps of metallography techniques.	**07**
		OR	
Q.5	**(a)**	Give different coding system of steel with suitable example.	**03**
	(b)	Explain the lever rule for 0.8% C in Fe-Fe_3C diagram.	**04**
	(c)	Classify the cast iron. What are the different forms of carbon in it? Explain any one with microstructure, phase present and application.	**07**

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