Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–IV (NEW) EXAMINATION – WINTER 2020

Subject Code:3142109 Date:11/02/2021

Subject Name:Physical Metallurgy

Time:02:30 PM TO 04:30 PM Total Marks:56

Instructions:

1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	Define: Crystal, Unit cell, lattice point	**03**
	(b)	Describe the crystal system as per the lattice parameter.	**04**
	(c)	Draw Fe-Fe_3C diagram and explain all invariant reaction in this diagram.	**07**
Q.2	**(a)**	Describe closest packed plane and direction for BCC and FCC.	**03**
	(b)	Draw crystal planes and direction of followings: a) $(\bar{1}\ 0\ \bar{1})$ b) (3 2 1) c) $[1\ \bar{1}\ \bar{1}]$ d) [1 1 1]	**04**
	(c)	Classify the cast iron according to graphite morphology and matrix structure. Describe any two cast irons with composition, microstructure and applications.	**07**
Q.3	**(a)**	Determine the atomic packing factor for FCC structure.	**03**
	(b)	Explain constitutional supercooling.	**04**
	(c)	Explain the lever rule by using phase diagram. What is use of lever rule?	**07**
Q.4	**(a)**	Define: Phase, Degree of freedom, Alloy	**03**
	(b)	Explain coding of steel according to IS standard and American standard.	**04**
	(c)	Draw cooling curve for pure metals, alloys, and eutectic and explain each point of curve.	**07**
Q.5	**(a)**	What do you mean by polymorphism in material science?	**03**
	(b)	Why FCC structure is more ductile than BCC and HCP structure?	**04**
	(c)	With the concept of free energy explain the homogeneous nucleation.	**07**
Q.6	**(a)**	What do you mean by curie temperature? Give examples.	**03**
	(b)	Draw the microstructure of eutectoid steel.	**04**
	(c)	Give the Hume-Rothery's rules for substitutional solid solution.	**07**
Q.7	**(a)**	Draw the graph for RN and RG versus temperature and explain the same.	**03**
	(b)	Draw phase diagram for Isomorphous system.	**04**
	(c)	What are the procedural steps to be performed to see the microstructure under microstructure of any metals? What is the name of the procedure?	**07**
Q.8	**(a)**	What is the basic difference between bright field illumination and dark field illumination?	**03**
	(b)	Draw liquidus line, solidus line, solvus line and eutectic in phase diagram.	**04**
	(c)	Explain the phase diagram for completely soluble in liquid phase and insoluble in solid phase.	**07**

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