

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		
Q.3	(c) Explain the Hume-Rothery rule for substitution solid solution.	07
	(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 ₃ C 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
