Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) EXAMINATION – SUMMER 2024

Subject Code:3142109 Date:08-07-2024

Subject Name: Physical 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.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	List the properties and applications of superalloys.	**03**
	(b)	Briefly explain the Eutectic, and peritectic reactions with proper examples of each.	**04**
	(c)	Define solid solution. Using examples explain Hume Rothery rules for formation of solid solutions.	**07**
Q.2	**(a)**	List the properties and applications of shape memory alloys.	**03**
	(b)	Discuss the properties and applications of titanium alloys.	**04**
	(c)	Discuss different methods of annealing in brief.	**07**
		OR	
	(c)	Discuss the properties and applications of grey cast iron and compare it with white cast iron.	**07**
Q.3	**(a)**	Discuss the advantages associated with water quenching.	**03**
	(b)	Explain the process of induction hardening.	**04**
	(c)	Explain Jominy end quench hardenability measurement test. List Factors affecting hardenability.	**07**
		OR	
Q.3	**(a)**	Discuss the process control parameter for induction hardening.	**03**
	(b)	Describe the requirements of a good quenching medium.	**04**
	(c)	Explain the tempering process of steels. Discuss the structural changes taking place during it.	**07**
Q.4	**(a)**	Briefly explain about the Martensite.	**03**
	(b)	Define and explain: phase and degree of freedom.	**04**
	(c)	Define equilibrium diagram. With help of suitable examples describe their role in the development of new alloys.	**07**
		OR	
Q.4	**(a)**	Briefly explain about the Cementite. .	**03**
	(b)	Draw cooling curves for pure metal and binary solid solution alloy.	**04**
	(c)	Draw and explain the Aluminium-Copper binary phase diagram.	**07**
Q.5	**(a)**	Explain the purpose of alloying of steel. Give suitable examples.	**03**
	(b)	Using suitable example discuss the allotropy of metals.	**04**
	(c)	Describe the continuous cooling transformation diagrams for Fe-C System.	**07**
		OR	
Q.5	**(a)**	Explain the effect of Ni, and Cr on the properties of steel.	**03**
	(b)	Discuss about formation of primary & intermediate phases.	**04**
	(c)	Draw and describe Iron–Iron Carbide equilibrium diagram. Label all components.	**07**

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