Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–V (NEW) EXAMINATION – WINTER 2024

Subject Code:3150508 Date:25-11-2024

Subject Name:Material Science and Engineering

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)**	Prepare a chart on the types of engineering materials based on nature and major areas of applications. Cite examples for each of them.	**03**
	(b)	Differentiate between crystalline and non-crystalline states.	**04**
	(c)	Explain macro, micro and sub structures of materials. Name some techniques by which these strictures are analyzed and characterized.	**07**
Q.2	**(a)**	Name the constituents of the following materials with percentage distribution: Chromel, Brass, Alumel	**03**
	(b)	Briefly discuss about the classification of polymers.	**04**
	(c)	What do you understand by levels of structure? Explain their types briefly.	**07**
		OR	
	(c)	Explain the mechanism of creep. Also discuss about the importance of creep resistant materials.	**07**
Q.3	**(a)**	Explain Frenkel defect and Schottky defect.	**03**
	(b)	Why is stainless steel non corrosive? Name important types of stainless steel.	**04**
	(c)	Discuss with examples general types of corrosion and their preventive measures.	**07**
		OR	
Q.3	**(a)**	Explain triple point with a diagram.	**03**
	(b)	Discuss various types of stoichiometric defects with neat sketches	**04**
	(c)	Draw the differences between edge and screw dislocation. What is grain boundary?	**07**
Q.4	**(a)**	What are the degrees of freedom of a system of two components when the number of phases is one, two, three, and so on?	**03**
	(b)	Explain glass transition temperature with suitable examples.	**04**
	(c)	State and explain Gibb's phase rule. Briefly explain the important phase transformation in steels.	**07**
		OR	
Q.4	**(a)**	Cite examples of some allotropes of carbon other than graphite and diamond (any two). State their important structural characteristics.	**03**
	(b)	Explain superconducting phenomena in brief.	**04**
	(c)	Stating the condition for the spontaneous occurrence of a phase transformation, discuss about the progressive transformation of a liquid to solid crystals by nucleation and growth with an illustration.	**07**
Q.5	**(a)**	How is semiconductor grade silicon synthesized? Write reaction.	**03**

	(b)	Define Fermi energy level. How does the electron distribution change at Fermi level when temperature is 0 K and above 0 K.	**04**
	(c)	Draw the tensile load-elongation curve and the true stress-true strain curve for a ductile material and explain the salient features.	**07**

OR

Q.5	**(a)**	Briefly discuss about soft and hard magnetic materials.	**03**
	(b)	Write a note on Ferromagnetism phenomena.	**04**
	(c)	Define Pilling-Bedworth ratio. State its importance in evaluating the oxidative corrosion propensity of various metals/metal oxides.	**07**

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