Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V(NEW) EXAMINATION – SUMMER 2022

Subject Code:3150508 Date:02/06/2022

Subject Name:Material Science and Engineering

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.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	**(a)**	Define ionization potential and state its importance.	**03**
	(b)	Classify engineering materials based on nature and major areas of applications. Cite examples for each of them.	**04**
	(c)	Explain various levels of structure of materials with illustrations.	**07**
Q.2	**(a)**	Name the constituents of the following materials with percentage distribution: Nichrome, Inconel, Alumel	**03**
	(b)	State the properties of ionic solids.	**04**
	(c)	Define Pilling-Bedworth ratio. State its importance in evaluating the oxidative corrosion propensity of various metals/metal oxides.	**07**
		OR	
	(c)	Discuss the structure-property relationship in engineering materials with suitable examples.	**07**
Q.3	**(a)**	Explain the mechanism of nucleation during crystal growth.	**03**
	(b)	Explain Frenkel and Schottky imperfections of ionic crystals with diagram. Give one example for each of them.	**04**
	(c)	Draw the differences between edge and screw dislocation. What is grain boundary?	**07**
		OR	
Q.3	**(a)**	State important applications of phase diagrams.	**03**
	(b)	Define/explain the following: (i) Tie line (ii) Lever rule (iii) degree of freedom (iv) 1-2-1 rule	**04**
	(c)	State and explain Gibb's phase rule. Briefly explain the important phase transformation in steels.	**07**
Q.4	**(a)**	Define tacticity. Classify polymers based on tacticity.	**03**
	(b)	Give four examples of ethylene based long chain polymers and state one industrial application for each of them.	**04**
	(c)	State the differences between thermoplastic and thermosetting polymers. Name the factors influencing the crystallinity of long chain polymers.	**07**

OR

Q.4.	**(a)**	Explain the general methods of strengthening of engineering materials.	**03**
	(b)	State the important applications of creep resistant materials.	**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**
Q.5	**(a)**	Explain superconducting phenomena in brief.	**03**
	(b)	Discuss potential applications of superconducting materials.	**04**
	(c)	Define creep. Discuss various mechanisms of creep with diagrams.	**07**

OR

Q.5	**(a)**	Why is stainless steel non corrosive? Name important types of stainless steel.	**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)	Discuss different types of corrosion with reasons for occurrence and prevention measures.	**07**

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