GUJARAT TECHNOLOGICAL UNIVERSITY
BE – SEMESTER- V EXAMINATION-SUMMER 2023

Subject Code: 3150508   **Date: 23/06/2023**
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)	Cite two examples of secondary bonding in materials and state its important properties (one for each example).	**03**
	(b)	Prepare a chart on the types of engineering materials based on nature and major areas of applications. Cite examples for each of them.	**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)	Explain the differences between ionic and covalent materials.	**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 bonding character and properties relationship of materials with suitable examples.	**07**
Q.3	(a)	Explain the mechanism of nucleation during crystal growth.	**03**
	(b)	Identify 3 types of crystal defects in solids (one point, one linear, and one planar) and suggest for each of these one material property that is adversely affected by its presence and one that is improved. Also state what to look for in a crystal that possesses each of these defects.	**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)	Explain 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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