Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – WINTER 2023

Subject Code:3162115 Date:07-12-2023

Subject Name:Advanced Materials

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.**

			MARKS
Q.1	**(a)**	Write applications of: 1) Dual Phase Steel, 2) TRIP Steel and 3) High Speed Steel.	**03**
	(b)	Explain the role of alloying elements in development of alloys.	**04**
	(c)	Explain the composition, properties and applications of Heat Resistant Cast Iron.	**07**
Q.2	**(a)**	Give a detailed classification of Tool Steels.	**03**
	(b)	Explain the heat treatment cycle for Maraging Steel.	**04**
	(c)	What is Stainless Steel? Which are important properties of Stainless Steel? Compare Austenitic S.S. and Martensitic S.S.	**07**
		OR	
	(c)	What are Alloy Cast Irons? Give the composition, properties and applications of High Silicon Cast Iron.	**07**
Q.3	**(a)**	Explain the role of high Sulfur content in Free Cutting Steel?	**03**
	(b)	Discuss the characteristics of Titanium that makes it attractive for engineering applications.	**04**
	(c)	Write a detailed comparison of Elctro-Rheological Fluid and Magneto-Rheological Fluids.	**07**
		OR	
Q.3	**(a)**	Give advantages and limitations of Magnesium to be used for engineering applications.	**03**
	(b)	Discuss the characteristics of Aluminium that makes it attractive for aerospace applications.	**04**
	(c)	Enlist the advantages of Smart Materials. Describe about shape memory alloys in detail.	**07**
Q.4	**(a)**	Define Metallic Glasses. Compare properties of Metallic Glasses with crystalline alloys.	**03**
	(b)	Explain the strengthening mechanism behind the high temperature strength of Nickel based Superalloys.	**04**
	(c)	Explain the Sol-Gel Technique for Nano-Material production.	**07**
		OR	
Q.4	**(a)**	Discuss the Piston and Anvil Technique to produce the Metallic	**03**

Glasses.

	(b)	Write the properties of Cobalt based Superalloys.	**04**
	(c)	Explain the composition, properties and applications of Iron based Superalloys.	**07**
Q.5	**(a)**	Describe the requirements of Cryogenic Materials. Give probable candidate materials that meet the requirements.	**03**
	(b)	Explain the working of Piezoelectric Materials.	**04**
	(c)	Write the types of Superconducting Materials. Explain the properties and applications of Superconducting Materials.	**07**

OR

Q.5	**(a)**	Explain the significance of glass transition temperature.	**03**
	(b)	What is Composite? Give a detailed classification of Composites.	**04**
	(c)	Define bio-functionality. Describe properties and application of Ni-Ti alloy as a useful Bio-Material.	**07**

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