Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3172109 Date:12-12-2023

Subject Name: Materials Characterization

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)**	Discuss functions of metal screens used in rotation method of diffraction .	**03**
	(b)	What is X-ray diffraction? How it is useful in material characterization?	**04**
	(c)	Explain Laue method of diffraction. List advantages and limitations.	**07**
Q.2	**(a)**	Describe the importance of Material characterization.	**03**
	(b)	Classify Material characterization techniques.	**04**
	(c)	Explain the principle, instrumentation, and applications of Turbomolecular pump.	**07**
		OR	
	(c)	What is vacuum gauge? Explain instrumentation and applications of Pirani gauge.	**07**
Q.3	**(a)**	Discuss significance of thermal analysis.	**03**
	(b)	Describe method used to calculate enthalpies of transitions from DSC curve.	**04**
	(c)	Describe the microstructural study by image analysis. Give applications.	**07**
		OR	
Q.3	**(a)**	Explain resolution of Microscope using the formula.	**03**
	(b)	Discuss the principle of Differential Interference Contrast (DIC) microscopy.	**04**
	(c)	What is Differential scanning calorimetry? Explain principle involved. List the applications.	**07**
Q.4	**(a)**	What is electron microscopy? How it differs from optical microscopy?	**03**
	(b)	With a ray diagram explain working of TEM.	**04**
	(c)	Explain principle and instrumentation of AFM. Give merits, and applications.	**07**
		OR	
Q.4	**(a)**	Give applications and limitations of Field Ion Microscope.	**03**
	(b)	Explain the principle and instrumentation of Field Ion Microscope.	**04**
	(c)	What is SEM? Using schematic compare SEM and TEM.	**07**
Q.5	**(a)**	What is Spectroscopy? Write their classification.	**03**
	(b)	With a block diagram explain the working of XRF system.	**04**
	(c)	Discuss Electron Probe Micro Analysis (EPMA) in terms of instrumentation and working principle.	**07**
		OR	
Q.5	**(a)**	Explain the principle of UPS.	**03**
	(b)	Explain how polished cast iron sample studied using Electron Spectroscopy for Chemical Analysis.	**04**
	(c)	Describe Atomic Emission Spectroscopy. List advantages of AES.	**07**

****