Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VII EXAMINATION – WINTER 2025

Subject Code: 3172109 Date:24-11-2025

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)**	Differentiate SEM and TEM.	**03**
	(b)	What is electron microscopy? How it differs from optical microscopy?	**04**
	(c)	Draw a schematic of scanning electron microscope. Briefly explain working of each component in SEM.	**07**
Q.2	**(a)**	Discuss the applications of Thermogravimetric analysis.	**03**
	(b)	Describe thermogravimetric analysis technique.	**04**
	(c)	Discuss the Working and applications of Differential scanning calorimetry.	**07**
		OR	
	(c)	What is XRF? Using a diagram explain the working of XRF system.	**07**
Q.3	**(a)**	Discuss the merits and applications of Turbomolecular pump.	**03**
	(b)	Explain the instrumentation of Turbomolecular pump.	**04**
	(c)	What is optical microscopy? Explain Hot Stage Microscopy.	**07**
		OR	
Q.3	**(a)**	Describe the effect of Numerical Aperture (N.A.) on resolution of the microscope.	**03**
	(b)	Describe Differential Interference Contrast (DIC) microscopy.	**04**
	(c)	What is vacuum gauge? Explain the principle and instrumentation of Penning gauge with their merits and applications.	**07**
Q.4	**(a)**	Describe the importance of Material characterization.	**03**
	(b)	Write applications and limitations of WDS.	**04**
	(c)	Explain the Atomic Microscopy. Give applications and limitations.	**07**
		OR	
Q.4	**(a)**	Give merits and applications of AFM.	**03**
	(b)	Explain the instrumentation of AFM.	**04**
	(c)	Describe Atomic Emission Spectroscopy. List advantages of AES.	**07**
Q.5	**(a)**	Discuss why X-ray Photoelectron Specroscopy needs Ultra High Vacuum.	**03**
	(b)	Explain the principle of UPS. Give applications.	**04**
	(c)	Explain the Powder (Debye Scherrer) method of X-Ray diffraction. How it is useful to study lattice parameter of crystal?	**07**
		OR	
Q.5	**(a)**	Explain how X-Rays are produced?	**03**
	(b)	Derive Bragg's law. Give its significance in study crystal structure.	**04**
	(c)	Explain Auger Electron Spectroscopy and its instrumentation.	**07**

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