

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-VII (NEW) EXAMINATION – WINTER 2021****Subject Code:3172109****Date:10/12/2021****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
<b>Q.1</b> (a) Describe difference between SEM and TEM.	<b>03</b>
(b) What is Material characterization? Classify Material characterization techniques.	<b>04</b>
(c) Discuss thermogravimetric analysis technique. List applications of TGA.	<b>07</b>
<b>Q.2</b> (a) Explain the method used to calculate enthalpies of transitions from DSC curve.	<b>03</b>
(b) Describe difference between Heat flux DSC and Power Compensated DSC.	<b>04</b>
(c) What is electron microscopy? Write a note on High Voltage Electron Microscopy.	<b>07</b>
<b>OR</b>	
(c) What do you mean by Vacuum gauge? Explain the principle and instrumentation of Pirani gauge with their merits and applications.	<b>07</b>
<b>Q.3</b> (a) Write a short note on Bright field microscopy.	<b>03</b>
(b) Discuss effect of wavelength and Refractive index of the medium on resolution of microscope.	<b>04</b>
(c) Explain the principle and instrumentation of AFM. Give merits and applications.	<b>07</b>
<b>OR</b>	
<b>Q.3</b> (a) Justify the requirements of vacuum conditions in SEM.	<b>03</b>
(b) Write a note on Insitu Metallography.	<b>04</b>
(c) Explain the principle and instrumentation of STM. Give applications.	<b>07</b>
<b>Q.4</b> (a) What is EDS? Why EDS X-ray analysis is done?	<b>03</b>
(b) Discuss briefly about various types of signal detectors of electron microscope.	<b>04</b>
(c) Discuss various methods of Atomic Emission Spectroscopy. List advantages of AES.	<b>07</b>
<b>OR</b>	
<b>Q.4</b> (a) What do you mean by photoelectron spectroscopy? Give applications of XPS.	<b>03</b>
(b) Explain the principle and working of WDS.	<b>04</b>
(c) Explain the principle and instrumentation of UPS. Give applications.	<b>07</b>
<b>Q.5</b> (a) What is X-ray diffraction? How it is useful in material characterization?	<b>03</b>
(b) Discuss about Ultraviolet-Visible Spectrophotometer.	<b>04</b>
(c) Explain briefly Powder (Debye Scherrer) method of diffraction. How it is useful to study lattice parameter of crystal?	<b>07</b>
<b>OR</b>	
<b>Q.5</b> (a) List advantages and disadvantages of Laue method of diffraction.	<b>03</b>
(b) What are the difficulties with the rotation method of diffraction? How it can be overcome?	<b>04</b>
(c) What do you mean by LEED. Explain the principle and instrumentation.	<b>07</b>

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