Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII • EXAMINATION – SUMMER • 2015

Subject code: 182105 **Date:05/05/2015**

Subject Name: Modern Techniques for Material Characterization

Time:10.30AM-01.00PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	What is X-ray diffraction? Explain briefly Powder (Debye Scherrer) method of diffraction. How it is useful to study lattice parameter of crystal?	**07**
	(b)	What is photoelectron spectroscopy? Explain the principle and instrumentation of X-ray Photoelectron Specroscopy. Give applications and limitations.	**07**
Q.2	**(a)**	What do you understand by Material characterization? Explain the Auger Electron Spectroscopy with sketch of instrumentation.	**07**
	(b)	What is Nuclear Magnetic Resonance (NMR) spectroscopy? List the applications of NMR methods.	**07**
		OR	
	(b)	Discuss Electron Probe Mico Analysis (EPMA) in terms of instrumentation and working principle using line diagram.	**07**
Q.3	**(a)**	Discuss the Principle, Working and application of DTA. Give the difference between DSC and DTA.	**07**
	(b)	What is resolution of Microscope? Describe the effect of (i) wavelength (ii) Numerical Aperture (N.A.) and (iii) Refractive index of the medium on resolution of the microscope.	**07**
		OR	
Q.3	**(a)**	Discuss thermogravimetric analysis technique? Explain principle involved. Mention the applications of Thermogravimetric analysis.	**07**
	(b)	What is Image Analysis? List the steps for microstructural study by image analysis. What are its applications?	**07**
Q.4	**(a)**	What is TEM? With a ray diagram explain working of TEM. Write applications of TEM.	**07**
	(b)	What is STEM? Discuss how it differs from conventional TEM and SEM. Write applications of STEM.	**07**
		OR	
Q.4	**(a)**	Draw schematic showing basic components of the scanning electron microscope. Briefly explain each component and its working.	**07**
	(b)	Discuss the techniques of replica preparation/ sample preparation for electron microscopy.	**07**
Q.5	**(a)**	What is Infrared (IR) spectroscopy? Explain IR region and IR spectrum. With a neat sketch explain IR Spectrometer.	**07**
	(b)	What is Atomic Emission Spectroscopy (AES)? Discuss various methods of Atomic Emission Spectroscopy. List advantages of AES.	**07**
		OR	
Q.5	**(a)**	What is Small Angle or Low Angle X-ray Scattering (LAXS)? Explain	**07**

working of LAXS instrument. Write applications and limitations of LAXS.

(b) What is the principle of Atomic absorption spectrometer (AAS)? List the instrumentation of AAS and explain working of it. List the applications & limitations. **07**

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