Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2172109 **Date: 06/05/2017**

Subject Name: Materials Characterization

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.**

Q.1	**(a)**	What is Material Characterization? Why it is important? List the techniques of material characterization. Which techniques are most commonly used for characterization and why?	**07**
	(b)	Draw a labelled diagram of optical microscope. Explain function of each part explaining critically its importance. Discuss Aberration and its remedies.	**07**
Q.2	**(a)**	What do you understand by Thermal Analysis Techniques? Explain briefly DTA with labelled diagram, working principle involved and applications.	**07**
	(b)	Derive Bragg's law for X-ray diffraction. Explain its application with Debye Scherer method for crystal structure determination.	**07**
		OR	
	(b)	Differentiate critically between DTA and DSC.	**07**
Q.3	**(a)**	In SEM the information is obtained with electron-solid interactions when electron beam strikes a sample. Explain with necessary schematic diagram.	**07**
	(b)	Differentiate between SEM and TEM in terms of working principle, sample preparation and applications.	**07**
		OR	
Q.3	**(a)**	Why vacuum is necessary in electron microscopy techniques? Discuss various pumps used for vacuum system.	**07**
	(b)	Image Analysis technique has importance in characterization of materials. Discuss critically with working principle, analysis techniques and applications.	**07**
Q.4	**(a)**	Discuss Atomic Absorption Spectroscopy (AAS) in terms of principle of working, characteristics and applications.	**07**
	(b)	Why surface characterization is necessary? Discuss ESCA (XPS) technique for surface characterization.	**07**
		OR	
Q.4	**(a)**	Explain briefly hot stage microscopy with its applications.	**07**
	(b)	Explain Heat Flux and Power Compensation DSC techniques.	**07**
Q.5	**(a)**	Discuss Infrared (IR) spectroscopy with reference to IR region and IR spectrum. Explain IR Spectrometer with neat sketch.	**07**
	(b)	Write a note on Auger Electron Spectroscopy.	**07**
		OR	
Q.5	**(a)**	Discuss FTIR in terms of working principle, advantages, limitations and applications.	**07**
	(b)	Discuss briefly STEM. List the difference between STEM and Conventional TEM. What are the applications of STEM?	**07**

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