Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII • EXAMINATION – SUMMER 2013

Subject Code: 182105 Date: 09/05/2013

Subject Name: Modern Techniques for Material Characterization (DE-II)

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.**

Q.1	**(a)**	What do you mean by photoelectron spectroscopy? Explain the principle and instrumentation of X-ray photoelectron spectroscopy (XPS). Give applications and limitations.	**07**
	(b)	Explain the Differential scanning calorimetry (DSC). List the applications. Describe the method used to calculate enthalpies of transitions from DSC curve.	**07**
Q.2	**(a)**	What is basic difference between SEM and TEM? With a ray diagram explain working of TEM. Discuss- Diffraction pattern in TEM.	**07**
	(b)	What do you meant by thermal analysis? Explain thermogravimetric analysis (TGA) technique. Discuss its applications.	**07**
		OR	
	(b)	Discuss the importance of Material characterization. With a block diagram explain the working of X-ray Fluoroscopy (XRF) system.	**07**
Q.3	**(a)**	Explain how infiltration of copper in steel and inclusion such as Cu_2O in tough pitch copper can be observed using Colour Metallography.	**07**
	(b)	Discuss the techniques of replica preparation/ sample preparation for electron microscopy.	**07**
		OR	
Q.3	**(a)**	What is STEM? Explain it. Give the difference between STEM and Conventional TEM. Write applications of STEM.	**07**
	(b)	What is Image Analysis? Discuss the steps for microstructural study by image analysis. Mention its applications.	**07**
Q.4	**(a)**	Draw schematic showing basic components of the scanning electron microscope. Briefly explain each component and its working in SEM.	**07**
	(b)	What is the principle of Atomic absorption spectrometry (AAS)? List the instrumentation of AAS and explain working of it. List the applications & limitations.	**07**
		OR	
Q.4	**(a)**	What is Infrared (IR) spectroscopy? Explain IR region and IR spectrum. With a neat sketch explain IR Spectrometer. List advantages, limitations and applications of IR analysis.	**07**
	(b)	What is Atomic Emission Spectroscopy? Discuss various methods of Atomic Emission Spectroscopy. List advantages of it.	**07**
Q.5	**(a)**	Explain briefly Powder (Debye Scherrer) method of diffraction. How it is useful to study lattice parameter of crystal?	**07**
	(b)	What is Auger Electron Spectroscopy? Explain the technique with sketch of instrumentation of this technique. Give applications and limitations.	**07**
		OR	
Q.5	**(a)**	What is X-ray diffraction? How it is useful in material characterization? Explain briefly Laue method of diffraction. What are the advantages and disadvantages of Laue method?	**07**
	(b)	Discuss Electron Probe Mico Analysis (EPMA) in terms of instrumentation and working principle using line diagram.	**07**

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