Seat No.: _____  Enrolment No. 

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2018**

**Subject Code: 2172109** **Date: 29/11/2018**

**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.**

| | | | MARKS |
|---|---|---|---|
| **Q.1** | **(a)** | What do you meant by thermal analysis? Give its significance. | **03** |
| | **(b)** | Describe the importance of Material characterization. | **04** |
| | **(c)** | Draw schematic showing basic components of the scanning electron microscope. Briefly explain each component and its working in SEM. | **07** |
| **Q.2** | **(a)** | Give the difference between Heat flux DSC and Power Compensated DSC. | **03** |
| | **(b)** | "DSC is widely used in industrial settings as a quality control instrument". Comment. | **04** |
| | **(c)** | Explain the principle and instrumentation of Diffusion pumps with their merits, limitations and applications. | **07** |
| | | **OR** | |
| | **(c)** | What do you mean by Vacuum gauge? Explain the principle and instrumentation of Ionization gauge with their merits, limitations and applications. | **07** |
| **Q.3** | **(a)** | Explain how electron microscopy differs from optical microscopy? | **03** |
| | **(b)** | What is Image Analysis? List the steps for microstructural study by image analysis. | **04** |
| | **(c)** | Define Magnification of Microscope. Explain Hot Stage Microscopy. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | Explain resolution of Microscope using the formula. | **03** |
| | **(b)** | Describe the principle of Differential Interference Contrast (DIC) microscopy. | **04** |
| | **(c)** | Write a note on High Resolution Electron Microscopy (HREM). | **07** |
| **Q.4** | **(a)** | Discuss the advantages and disadvantages of powder diffraction method. | **03** |
| | **(b)** | Explain how polished cast iron sample can be studied Using ESCA. | **04** |
| | **(c)** | What do you mean by AFM? Explain the principle and instrumentation. Give merits, limitations and applications. | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | Discuss merits, limitations and applications of STM. | **03** |
| | **(b)** | Explain the principle and instrumentation of STM. | **04** |
| | **(c)** | Compare X-ray Photoelectron Spectroscopy and Auger Electron Spectroscopy techniques. | **07** |
| **Q.5** | **(a)** | What is Raman Effect? How it arises? | **03** |
| | **(b)** | With a neat sketch explain IR Spectrometer. | **04** |
| | **(c)** | What is XRF? With a block diagram explain the working of XRF system. | **07** |

**OR**

| | | | |
|---|---|---|---|
| **Q.5** | **(a)** | Write applications and limitations of Rutherford backscattering spectroscopy. | **03** |
| | **(b)** | Explain the Secondary Ion mass spectrometry (SIMS). | **04** |
| | **(c)** | Explain briefly Laue method of diffraction. What are the advantages and disadvantages of Laue method? | **07** |

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