



**BBN-0030498004**

Seat No. \_\_\_\_\_

**B. Sc. / M. Sc. (Applied Physics) (Sem. VIII)  
(CBCS) Examination**

**July - 2021**

**Paper - VIII : Advanced Experimental Techniques  
for Materials Characterization  
(New Course)**

Time :  $2\frac{1}{2}$  Hours]

[Total Marks : 70

Instructions: (1) Attempt any FIVE questions.

(2) Numbers in the right margin indicate marks

- 1 Answer the following questions. 14
  1. What is the principle of operation for Atomic force microscopy?
  2. What are contact and non-contact mode in Atomic force microscopy?
  3. What are the major components in TEM?
  4. Write down the general applications of Rutherford Backscattering spectroscopy.
  5. Draw a well labelled sketch diagram of TGA setup.
  6. Explain thermo-balance of TGA.
  7. Draw a well labelled sketch diagram of DTA setup.
  
2. Answer the following questions. 14
  1. What is Hall Effect?
  2. What is magnetoresistance?
  3. Draw a typical M-H loop for a ferromagnetic substance and explain it.
  4. Why generally semiconductors are used for Hall Effect measurements?
  5. What is the principle of IR spectroscopy?
  6. Why the core electrons are so important in X-ray photoelectron spectroscopy?
  7. Why ultra-high vacuum is needed in XPS?
  
- 3 Answer the following questions. 14
  1. Write a detailed note: Atomic force Microscopy.
  2. Compare: optical microscopy, Tunneling Microscopy and Scanning electron microscopy.

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|----|---|----|
| 4  | Answer the following questions.   | 14 |
| 1. | a) Explain: Secondary electrons in scanning electron microscopy.                        | 5  |
|    | b) How the scanning electron microscopy works?  | 2  |
| 2. | a) How the image of grains is produced in scanning electron microscopy?                 | 3  |
|    | b) Write down the disadvantages of Electron microscopy.                                 | 4  |
| 5  | Answer the following questions.   | 14 |
| 1. | Write a detailed note: Differential Scanning Calorimetry                                |    |
| 2. | Explain power compensated DSC.  |    |
| 6  | Answer the following questions.   | 14 |
| 1. | Write a detailed note: Differential Thermal Analysis                                    |    |
| 2. | How will you read a typical RBS spectrum?   |    |
| 7  | Answer the following questions.   | 14 |
| 1. | a) Draw a schematic diagram for Hall effect experimental set up.                        | 3  |
|    | b) Write down the applications of Hall effect.  | 4  |
| 2. | Write a detailed note: 1) Magnetic DC susceptibility<br>2) Magnetic AC susceptibility   |    |
| 8  | Answer the following questions.   | 14 |
| 3. | Explain the M-H loops for different type of magnetic materials in detail.               |    |
| 4. | Explain: Jahn-Teller distortion in detail   |    |
| 9  | Answer the following questions.   | 14 |
| 1. | a) Write down advantages and disadvantages of IR spectroscopy.                          | 3  |
|    | b) Explain Beer-Lambert law for absorption spectroscopy.                                | 4  |
| 2. | How will you calculate the optical band gap using UV-Vis spectra?<br>Explain in detail. |    |
| 10 | Answer the following questions.   | 14 |
| 1. | Write a detailed note: applications of UV-Vis spectroscopy.                             |    |
| 2. | a) How does the XPS works?  | 3  |
|    | b) Write down advantages and disadvantages of XPS.                                      | 4  |