



Seat No. _____

HC-003-0498004

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

April - 2023

**Advanced Experimental Techniques
of Materials Characterization : Paper-VIII**

(New course)

Faculty Code : 003

Subject Code : 0498004

Time : $2\frac{1}{2}$ / Total Marks : 70

Instructions :

- (1) All questions are compulsory.
- (2) Numbers in the right margin indicate marks.

- 1** Attempt any seven short questions : (two marks each) **14**
- (1) Why the wavelength of X-ray suitable for XRD technique ?
 - (2) How the crystallite size is calculated from XRD data ?
 - (3) What type of signals are produced during a Scanning electron microscopy from the sample ?
 - (4) What are the secondary electrons in SEM ?
 - (5) Write down the application of DSC.
 - (6) Why four-point probe method is superior over two-point probe method for resistivity measurements ?
 - (7) What are the type of spectroscopy ? Explain in short.
 - (8) What quantities of a material can be decided using hall effect experiment ?
 - (9) What is $\pi - \pi^*$ transition of electrons in UV spectroscopy ?
 - (10) What are the uses of XPS ?
- 2** Write answers of any two : **14**
- (1) (a) Compare Neutrons and X-rays as diffraction tools for materials characterization. **5**
 - (b) What do you mean by elastic and inelastic scattering of neutrons ? **2**
 - (2) (a) How the scanning electron microscopy works ? **3**
 - (b) Explain : Secondary electrons in scanning electron microscopy. **4**

- (3) (a) Why neutrons should be used as a materials probe ? 5
 (b) Draw a schematic diagram for powder neutron diffractometer. 2
- (4) How does the scanning electron microscope works ?
 Explain in detail with a schematic diagram. 7
- 3** Write answers of any two : 14
- (1) (a) Draw a well labelled sketch diagram of TGA setup. 3
 (b) What the uses of TGA ? 4
- (2) Write a detailed note : Differential Thermal Analysis. 7
- (3) Write a detailed note : Differential Scanning Calorimetry. 7
- (4) (a) What are the main strengths and weaknesses of Rutherford Backscattering spectroscopy ? 5
 (b) Why Rutherford Backscattering spectroscopy is a good tool for thin film characterization ? 2
- 4** Write answers of any two : 14
- (1) Explain in detail :
 (a) Ordinary magnetoresistance. 3
 (b) Anisotropic magnetoresistance. 4
- (2) Explain colossal magnetoresistance in detail. 7
- (3) Write a detailed note on magnetic DC and AC susceptibilities. 7
- (4) (a) Why generally semiconductors are used for Hall effect measurements? 3
 (b) Write down the applications of Hall effect. 4
- 5** Write answers of any two : 14
- (1) (a) What are the Stroke and Antistroke lines in Raman spectra ? 3
 (b) How will you calculate the optical band gap using UV-Vis spectra ? 4
- (2) Write a detailed note : applications of UV-Vis spectroscopy. 7
- (3) What types of intensity shifts occur in a UV-Vis spectroscopy ? Explain in detail. 7
- (4) (a) Compare : Raman spectroscopy and IR spectroscopy. 5
 (b) Why water cannot be used as a sample in IR spectroscopy ? 2
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