BBC-003-1204003 Seat No. _____

M. Sc. (Sem. IV) (CBCS) Examination

July - 2021

Physics : ET-07

(Materials Characterization)

Faculty Code : 003
Subject Code : 1204003

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) All questions carry equal marks.
(2) Attempt any five questions.
(3) Figures to the right indicate marks.

1 Answer the followings (Each 2 Marks) **14**

(i) How x-rays are produced?
(ii) Which equations represent d spacing formula and unit cell volume for the orthogonal crystal?
(iii) What Moseley's law suggests?
(iv) What is Scherrer's formula?
(v) Which kind of materials can not be studied through STM or SFM?
(vi) Which kind of informations can be derived through SEM image?
(vii) What is the principle of TEM?

2 Answer the followings (Each 2 Marks) **14**

(i) Write a statement of Beer's Law.
(ii) Define charge transfer process in UV sensitive compounds.
(iii) Define "CHROMOPHOROUS".
(iv) Write a two essential criteria for a compound to absorb IR radiation.
(v) What is TGA? Describe Dynamic TGA, Isothermal TGA and Quasistatic TGA
(vi) What is lock-in amplifier? Where it is used?
(vii) Give names of Ferroelectric material crystals.

3 Answer the following **14**

(1) Discuss the effect of crystal size on powder pattern.

(2) Explain the influence of crystal symmetry and multiplicities on powder pattern.

4 Answer the following **14**

(1) Discuss the Scanning Electron Microscopy (SEM) with special reference to Physical Basic of Operation?

(2) Explain TEM with special reference to Resolution and Sample preparation.

5 Answer the following **14**

(1) Discuss in detail on the structural determination from powder patterns.

(2) Write a short note on STM and SFM.

6 Answer the following **14**

(1) Discuss UV-viz technique along with possible electronic transitions.

(2) Write a note on UV-viz spectrometer, a typical instrumentation.

7 Answer the following **14**

(1) Describe, molecular vibrations in FTIR.

(2) Enlist IR sources and types of transducers used in FTIR, explain in brief.

8 Answer the following **14**

(1) Explain various types of polarizations in dielectric material and discuss the dielectric response at different frequency. What is dielectric loss?

(2) What is importance of two point and four point probes resistivity measurement? Describe Van der Pauw method of resistivity measurement.

9 Answer the following **14**

(1) Draw a block diagram of typical TGA set up. Explain each part in detail.

(2) Write a short note on SQUID and its applications.

10 Answer the following **14**

(1) Explain DTA in context of principle, types and applications.

(2) Write a brief note on VSM.