

Exam.Code:1029  
Sub. Code: 7852

1129

M. Tech. (Material Science and Technology)  
First Semester  
MST-102: Material Characterization

Max. Marks: 50

Time allowed: 3 Hours

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit.

x-x-x

I. Attempt the following:-

- How one can determine particle size with x-ray diffraction?
- In an Auger process, what affects the binding energy of an ejected electron?
- Explain the working principal and construction of an penning-gauge
- What is the role of precursor and carrier gas in a CVD process? (4x2½)

UNIT - I

II. a) Define the atomic scattering and geometrical structure factor.

III. b) Calculate structure factor for a fee unit cell.

c) Explain possible reasons that cause discrepancies between the peak positions of an X-ray spectrum and its standard data. (5,3,2)

IV. a) Describe the epitaxial growth modes in MBE process.

b) In an MBE process discuss the role of RHEED in determining the surface quality of the substrate as well as film thickness. (5,5)

V. a) Explain the working principal and applications of the thermogravimetric analysis.

b) List similarities and differences between TGA and DSC.

c) Sketch a DSC curve that shows a melting peak with a low and a high heating rate. (4+3+3)

UNIT - II

VI. a) How elemental identification is performed using the X-ray fluorescence Spectroscopy?

b) Impact of molecular symmetry and selection rules on Raman spectra. (5+5)

P.T.O.

(2)

- VII. Write short notes on any two of the following:-
- a) FTIR spectroscopy
  - b) Particle size determination methods
  - c) Luminescence spectroscopy (2x5)
- VIII. a) Describe the x-ray fluorescence processes and related selection rules.  
b) Discuss its application in trace element analysis. (5,3,2)

x-x-x