

Total Pages—4

(Set-T₁)

B.Tech-7th

Characterization of Materials

Full Marks : 70

Time : 3 hours

**Answer six questions including
Q.No.1 which is compulsory**

The figures in the right-hand margin indicate marks

Symbols carry usual meaning

1. Answer *all* questions : 2×10
- (a) What is meant by resolving power of an objective and how is that distinguished from resolution ?
 - (b) What are secondary electrons ?
 - (c) Define Bragg's law and mention its importance.
 - (d) Mention two disadvantages of Scanning electron microscopy compared to Optical Microscopy.

(Turn Over)

- (e) What is the full form of EDS ? How much of an element must be present to show up on EDS ?
- (f) Mention two differences between diffraction and deflection.
- (g) What is the relationship between numerical aperture and brightness of an image ? Between magnification and brightness of an image.
- (h) What is Thermogravimetric Analysis ? Mention two applications of TGA.
- (i) How the enthalpy melting of sample is measured by Differential Scanning Calorimeter ?
- (j) What is the difference between depth of field and depth of focus ?
2. (a) What is aberration ? What is its importance ?
Mention the various types of aberrations. 5
- (b) What is a reflected light microscope ? Explain its working principle and construction. 5

3. (a) Explain the generation of secondary electrons and back scatter electrons through an electron-specimen interaction concept. 5
- (b) Draw a neat sketch and explain the working principle of Scanning Electron Microscopy. 5
4. (a) Explain the differences between an EDS and WDS. Mention two advantages of WDS over EDS. 5
- (b) Explain briefly about X-ray scattering. 5
5. (a) Explain briefly X-ray production in an X-ray tube with a neat sketch. 5
- (b) Define plane spacing equation. Give plane spacing equation for a tetragonal and cubic structures. 5
6. (a) Explain briefly the principle of Atomic force microscopy. How is it different from electron microscope ? 5
- (b) What is Thermogravimetric analysis ? Explain its construction in detail. 5

7. (a) Explain the importance of specimen preparation for Transmission electron microscopy. 5
- (b) Mention five differences between DSC and DTA. 5
8. Write short notes on any two : 5 × 2
- (i) Bragg-Bretano method
 - (ii) Effective magnification
 - (iii) Types of electron guns
 - (iv) Comparison between Raman and IR methods.