

Total number of printed pages – 7 **B. Tech**
CPMT 6404

Eighth Semester Examination – 2008

CHARACTERIZATION OF MATERIALS

Full Marks – 70

Time : 3 Hours

*Answer Question No. 1 which is compulsory
and any **five** from the rest.*

*The figures in the right-hand margin
indicate marks.*

1. Answer all the questions : 2 × 10
- (a) The main physical techniques used to characterize solids such as _____ and _____.

- (b) X-ray powder diffraction technique is indexed on one of two methods such as _____ and _____.
- (c) The small angle X-ray scattering is used for detecting inhomogeneities in solids on the scale of _____ to _____.
- (d) Neutron diffraction is used to distinguish between atoms that have similar X-ray scattering powers, such as _____ or _____.
- (e) _____ and _____ of electrons is mainly responsible for image formation in TEM.

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Contd.

- (f) Thermal Analysis techniques provide the basic information such as _____ and _____ of samples.
- (g) TGA determines the process of weight changes as a _____ and _____.
- (h) The low angle grain boundaries and dislocation can be seen as _____ and _____ under metallurgical microscope.
- (i) _____ and _____ of solids can be determined by spectroscopic technique.
- (j) HREM is capable of giving information on _____ having resolution _____.

2. (a) Define diffraction. Briefly explain the different diffraction technique. 4
- (b) What is quantitative X-ray powder diffraction ? Discuss the available of different quantitative technique for materials characterization. 6
3. (a) State the difference between small angle X-ray and neutron diffraction. 4
- (b) What is electron diffraction ? Explain briefly the advantages and limitations of electron diffraction over X-ray diffraction. 6

4. (a) Define thermogravimetry. Discuss the major factors and application of the thermogravimetry of materials characterization. 4
- (b) State the difference between DTA and DSC. 3
- (c) Explain briefly the effect of acceleration voltage on resolution of SEM ? 3
5. (a) What is transmission electron microscope ? Describe the different basic components of electron microscope. 4
- (b) State your answer, there are many different spectroscopic techniques but all work on the same basic principle. 3

- (c) Differentiate between IR and Raman spectroscopy. 3
6. (a) What is NMR spectroscopy ? Explain how it is different from other spectroscopic techniques used for materials characterization. 4
- (b) Differentiate between EPMA and EMMA 3
- (c) Define XRF, AEFS, and EXAFS. 3
7. (a) What is X-ray ? Explain the different techniques of x-ray used for materials characterizations. 4
- (b) Discuss the different contrast development techniques used in optical microscopes. 6

8. (a) Discuss the interaction of electron beam with a solid sample. Explain the result of elastic and inelastic interaction of electron beam. 5

(b) Define aberration. Discuss the different aberration technique available in SEM.

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