



B.E/B. Tech (Full Time) DEGREE END SEMESTER EXAMINATION APRIL/MAY 2012
MATERIALS SCIENCE AND ENGINEERING
FIFTH SEMESTER – R 2008
ML 9303 – CHARACTERISATION OF MATERIALS

Time: 3 hr

Max. Marks: 100

PART – A (2 X 10 =20)

1. What is the application of reflective objectives?
2. What do you mean by empty magnification?
3. What are the advantages of auger spectroscopy?
4. What is the structure factor for simple cubic system?
5. Why high angle diffraction, is chosen for lattice parameter determination?
6. Which method of sample preparation is desired for residual stress analysis by XRD?
7. What is the application of non-contact AFM?
8. Which mode of operation yields better resolution in SEM, backscattered or secondary electron mode and why?
9. What is the advantage of DTG over TG analysis?
10. Give TWO examples for which endothermic and exothermic peaks occur in DTA.

PART – B (5 X 16 =80)

11. (a) A Debye-Scherrer pattern of copper ($a = 3.615 \text{ \AA}$) is made from with $\text{Cu } K_{\alpha}$ radiation ($\lambda = 1.542 \text{ \AA}$). Data given in Table 11.1 are for the first six lines (increasing order of angle) on the pattern:

Table 11.1

Line	f	p
1	22.1	8
2	20.9	6
3	16.8	12
4	14.8	24
5	14.2	8
6	12.5	6

- (i) Find the 2θ position for the given material and index them. (6)
- (ii) Calculate the relative integrated intensity of the peaks. (10)

12. (a) (i) Draw and discuss on Kohler Illumination system. (8)
(ii) Brief on the various methods of sample preparation for optical microscopy. (8)

(OR)

- (b) (i) Comment on various types of aberration of lens with appropriate sketches. (10)
(ii) How polarized light is useful in enhancing contrast. (6)

13. (a) (i) Show that diffraction at two different inclination helps in determination of residual stress of the materials.

(OR)

- (b) (i) Brief on the parametric method of phase diagram construction using XRD. (6)
(ii) Compare and contrast between various types of counters. (10)

14. (a) (i) Draw the ray diagram for imaging and diffraction analysis in TEM. (4)
(ii) Brief on various type of sample preparation techniques followed in TEM. (12)

(OR)

- (b) (i) List the various signals out of electron beam materials interaction in SEM and state its energy, escape depth and usefulness in characterization. (12)
(ii) What is the correlation between spot size and magnification? (4)

15. (a) (i) Brief on instrumentation of power compensated and heat flux DSC. (12)
(ii) List the application of DSC. (4)

(OR)

- (b) (i) Differentiate between EDX and WDX? (6)
(ii) Compare TG and DTA with reference to instrumentation and application. (10)