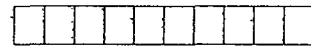


15/11/13.



B.E/B. Tech (Full Time) DEGREE END SEMESTER EXAMINATION NOV/DEC 2013

MATERIAL SCIENCE AND ENGINEERING

FIFTH SEMESTER – R 2008

17

ML 9303 – CHARACTERISATION OF MATERIALS

Time: 3 hr

Max. Marks: 100

**PART – A (2 X 10 =20)**

Answer the following by graphical/pictorial representation ONLY:

1. Lateral magnification due to chromatic aberration.
2. Influence of Compton scattering on intensity.
3. Determination of solvus line of phase diagram by parametric method of XRD.
4. Interaction of forces in contact mode AFM.
5.  $E_{KLiL2.3} \approx E_{BK} - E_{BLi} - E_{BL2.3}$

Justify the following statements.

6. Depth of field decrease with increase in resolution.
7. Absorption factor neglected in Debye Scherrer method.
8. Preferred orientation may mislead the structure factor calculation.
9. AFM Phase imaging provides highest resolution than STM.
10. DSC is equivalent to quantitative DTA.

**PART – B (5 X 16 =80)**

11. (a) Diffractogram 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  $2\theta$  position for the given material and index them. (6)
- (ii) Calculate the relative integrated intensity of the peaks. (10)

12. (a) (i) Brief on the various artifacts that may arise in optical microscopy. (8)  
(ii) Describe how phase contrast arises in optical microscopy images. (8)  
(OR)
- (b) (i) Compare the contrast attainable in DIC and polarized microscopy. (8)  
(ii) Describe Kohler Illumination system. (8)
13. (a) (i) Show that diffraction at two different inclination helps in determination of residual stress of the materials. (10)  
(ii) Derive an expression for average grain size by XRD. (6)  
(OR)
- (b) (i) Comment on the quantitative phase determination by direct comparison method. (6)  
(ii) Compare the various types of counters in terms of counting losses, Counting efficiency and energy resolution. (10)
14. (a) (i) Brief on the application of various mode of operation of STM. (6)  
(ii) Compare the dynamic operational modes of operation of AFM in terms of probe, signal processing and their applications. (10)  
(OR)
- (b) (i) Discuss on the electron beam materials interaction in SEM and various modes of operation.
15. (a) (i) Brief on instrumentation of power compensated and heat flux DSC. (10)  
(ii) Illustrate with examples the use of TG? (6)  
(OR)
- (b) (i) Differentiate between EDX and WDX. (8)  
(ii) Brief on the techniques of AES and XPS. (8)