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Total number of printed pages – 2

B. Tech  
PCMT 4401

**Seventh Semester Examination – 2013**

**X-RAY AND ELECTRON MICROSCOPY**

**BRANCH : MME, MM**

**QUESTION CODE : C-297**

**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 the following questions : 2 × 10
- (a) \_\_\_\_\_ filter is used for Mo target in X-ray tube for the X-ray generation.
- (b) \_\_\_\_\_ was the first crystal determined by X-ray diffraction.
- (c) The geometry of sample is determined by \_\_\_\_\_ diffraction technique.
- (d) The shape of diffraction pattern in Laue method is \_\_\_\_\_.
- (e) The intensity of X-ray diffraction is \_\_\_\_\_ structure factor.
- (f) X-ray diffraction peak broadening is contributed due to \_\_\_\_\_.
- (g) The typical CuAu phase belongs to \_\_\_\_\_ crystal system.
- (h) Image formation in SEM is due to \_\_\_\_\_ electrons from the specimen.
- (i) The main advantage of TEM over SEM is \_\_\_\_\_.
- (j) SAD pattern of TEM represents \_\_\_\_\_ of crystal.
2. (a) Draw a schematic diagram of X-ray generation. Explain the properties of continuous and characteristic X-ray radiation. 5
- (b) Write short notes on Moseley's law and Bragg's law. 5

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3. (a) What is Debye Scherer method ? Describe the process of crystal structure determination and its limitation. 5
- (b) Determine the crystal structure and lattice parameter from the following 20 values of 38.43, 44.67, 65.02, 78.13, 82.33, 98.93, 111.83, and 116.36 recorded using Cu K $\alpha$  radiation. 5
4. (a) What is integrated intensity of X-ray diffraction ? Explain briefly the factors that affect the diffracted intensity. 5
- (b) What is structure factor? Derive the structure factor of copper. 5
5. (a) What is residual stress? How is it determined by using X-ray diffraction ? 5
- (b) What is electromagnetic lens? Explain briefly its principles and its function. 5
6. (a) Draw the schematic line diagram of SEM and level its different components. 5
- (b) Describe briefly the different interaction of electron beams with the specimens. 5
7. (a) Describe the dark and bright field image formation in TEM using ray diagram. 5
- (b) What is SAD pattern? Briefly describe the process of crystal structure determination using SAD pattern. 5
8. Answer ANY TWO of the following: 5  $\times$  2
- (a) Thomson scattering and Compton scattering
- (b) Order and disorder transformation
- (c) Energy and Wavelength dispersive X-ray spectroscopy
- (d) Chromatic and spherical aberration.

