

B.E. (MET) Part-III 5th Semester Examination, December 2012
X-RAY AND CRYSTALLOGRAPHY (MT-503)

Time: 3 hours

Full Marks :70

Answer question no. 1 and any Five from the rest
Marks in the margin indicate full marks
All parts of a question must be written at one place
Give neat sketches wherever necessary
Graph paper may be required

1. Answer the following (any Five): [4 x 5]
 - (a) How does the applied voltage affect the continuous x-ray spectrum of target metal?
 - (b) Wavelength of k-absorption edge is less than that of k-characteristic spectrum
 - (c) Explain multiplicity factor.
 - (d) There is no diffraction from $(1\bar{1}0)$ plane in a fcc crystal. Justify.
 - (e) Calculate the interplanar angles between (101) & (110) and (110) & $(1\bar{1}0)$ sets of planes.
 - (f) $(1\bar{1}1)$ plane does not belong to a zone whose zone axis is $[100]$, but belongs to a zone whose zone axis is $[110]$.
 - (g) Explain the principle of a collimator and its function in X-ray diffraction study.
2. (a) Explain why a series of K lines — $K_{\alpha 1}$, $K_{\alpha 2}$ and K_{β} appear in the characteristic spectrum of X-rays?
(b) Explain why broadening of diffraction pattern is observed under non-ideal conditions. [5+5]
3. Compare the relative advantages and disadvantages of Proportional counter, Geiger counter and Scintillation counter as used in X-ray. [10]
4. Briefly discuss the Lattice Parameter method of determining the solvus curves using X-ray. [10]
5. Explain the Hanawalt method of qualitative chemical analysis using X-ray diffractometry. Identify the practical difficulties in this procedure. [7+3]
6. List the different methods of quantitative analysis using X-ray spectroscopy. Briefly discuss the causes of errors and the way to overcome them. [10]
7. Neatly draw the two dimensional reciprocal lattice of a bcc crystal at least for two planes, in scale, showing all the reciprocal lattice vectors present there. (001) is the plane of reflection. Lattice parameter of the crystal is 4\AA . [10]
8. Write technical notes on: [5 x 2]
 - (a) Mass absorption coefficient
 - (b) Semiconductor counter.