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Total Number of Pages: 02

B.Tech
PCMT4401

7th Semester Regular / Back Examination 2016-17

X - RAY AND ELECTRON MICROSCOPY

BRANCH: METTA,MME

Time: 3 Hours

Max Marks: 70

Q.CODE: Y422

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

The figures in the right hand margin indicate marks.

Q1 Answer the following questions: (2 x 10)

- a) Draw schematic diagram of the x-ray tube.
- b) Define diffraction. Give an example.
- c) What is electromagnetic lens? Explain It's function.
- d) What is structure factor? Give its significance.
- e) What is elastic scattering? Give an example.
- f) What are lens defects? Name the types of defect.
- g) What is thermionic emission? Give an example.
- h) What is secondary electron? Give its uses.
- i) What is line of broadening? Give its reasons.
- j) What is texture? Give an example.

Q2 The diffraction pattern of fine powders of a cubic metal was recorded using CuK_α radiation in the range of 2θ values i.e. 44.53, 51.89, 76.45, 93.01, 98.51, 122.12 respectively to the peak position. Identify the Bravais lattice and calculate the lattice parameter of cubic metal. **(2+8)**

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- Q3** a) Define scattering? Explain the Thomson's scattering of polarized electron. (5)
- b) Differentiate between the Bremsstrahlung radiation and characteristics radiation (5)
- Q4** a) Calculate the 2θ values of the first six peaks expected in X-ray diffraction pattern of Germanium which has the diamond cubic structure with lattice parameter $a=0.5658\text{nm}$. Assuming that $\text{CuK}\alpha$ radiation is used. (5)
- b) Explain briefly the scattering of X-ray by an atom with neat sketch. (5)
- Q5** a) What is electron microscopy? Explain briefly the basic principles of electron microscopy. (5)
- b) What is electron microanalysis? Explain the basic principles and application of electron microanalysis. (5)
- Q6** a) Discuss the advantages and disadvantages of transmission electron microscope over scanning electron microscope. (5)
- b) Describe interaction of incident electron beam over the samples (5)
- Q7** What is Scherrer Equation? Derive the Scherrer Equation for a crystal of thickness t has $(m+1)$ planes in the diffraction direction of incident x-ray. (10)
- Q8** Write short answer on any TWO: (5 x 2)
- a) Filter
- b) Rotating crystal method
- c) Everhart-Thornley Detector
- d) Selected Area Electron Diffraction Pattern
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