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Total Number of Pages: 01

B.Tech.
PCMT4401

7th Year Regular/Back Examination 2017-18

X-Ray and Electron Microscopy

BRANCH : METTA, MME

Time: 3 Hours

Max Marks: 70

Q.CODE: B295

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) What is secondary electrons? (2)
- b) Any two difference between WDS & EDS (2)
- c) Differentiate between SEM & TEM (2)
- d) What is the principle of Laue method? (2)
- e) What is continuous spectrum? (2)
- f) Draw the given directions [111], [110], [121], [200] (2)
- g) Draw the given planes (100) (200) (111) (110) (2)
- h) Derive Bragg's law of diffraction. (2)
- i) What is diffraction? (2)
- j) What is characteristic spectrum? (2)
- Q2 a) Calculate the velocity and kinetic energy with which the electrons strike the target of an x-ray tube operated at 50,000 volts. What is the short-wavelength limit of the continuous spectrum emitted and the maximum energy per quantum of radiation? (5)**
- b) Show that a relationship between real and reciprocal lattice is $r.d^* = uh + vk + wl = m$ (m is an integer) (5)
- Q3 a) Draw X-ray diffraction spectra for both ideal and non-ideal condition of diffraction and explain why there is difference between these two spectra. (5)**
- b) Define structure factor. Calculate the structure factor for FCC lattice. (5)
- Q4 a) With schematic diagram explain the working principles of X-ray diffractometer. (5)**
- b) Explain the working Principle and Operation of SEM with a neat sketch. (5)
- Q5 a) What are the merits and demerits of each type of vacuum pump? (5)**
- b) What is the extent of the area (depth, spread) in which characteristic x-rays are produced? (5)
- Q6 a) Explain the working Principle and Operation of TEM with a neat sketch. (5)**
- b) At what point does TEM differ from an optical microscope? (5)
- Q7 Is the peak density (number of peaks per 2θ angle) higher at low 2θ or at high 2θ in X-ray diffraction spectra? Why? Use a cubic crystal as an example to interpret this phenomenon. (10)**
- Sketch a two-dimensional plane of the reciprocal lattice for a BCC with a plane normal as [001]
- Q8 Write short answer on any TWO: (5 x 2)**
- a) Powder Diffraction (2)
- b) Wavelength dispersive spectroscopy (2)
- c) Scanning Tunneling Microscopy (2)
- d) Field Ion Microscopy (2)