

B. E. Metallurgical and Material Engineering, 4th Yr. 2nd Sem. Examination, 2018**X- Ray and Electron microscopy**

Time: Three hours

Full Marks: 100

Answer any five questions from the following. (Answer all parts of a question sequentially in a common place)

1. a) Define a pole and trace of a pole.

b) Draw the standard projection of cubic crystals on (111) plane. 8+12

2. a) Explain the generation of Characteristic radiation. State Moseley's Law.

b) What is known as Fluroscent Radiation?

c) What is non ideal Diffraction? Derive Scherrer's Formula and calculate the particle size.

6+4+10

3. a) Suppose that a Ni Filter is required to produce an intensity ratio of Cu K_α to Cu K_β of 100/1 in the filtered beam. Calculate the thickness of the filter and the transmission factor for Cu K_α line [μ/ρ of Ni for Cu K_β radiation = $286 \text{ cm}^2/\text{gm.}$] .

b) Calculate the values of 2θ and (hkl) for the first three lines (those of lowest θ values) of the powder patterns of substances with the following structures, the incident radiation is Cu K_α ,

i) simple cubic ($a = 3\text{\AA}$)

ii) simple face centred cubic ($a = 3\text{\AA}$)

iii) simple tetragonal ($a = 2\text{\AA}$, $c = 3\text{\AA}$)

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4. a) What is Reciprocal Lattice. State its properties and prove them.

b) Explain Ewald's construction.

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5. Name the factors which affect the relative intensity of the diffraction line of a powder pattern.

b) Discuss how Lorentz factor and multiplicity factor affect the relative Intensity?

or

b) Discuss how Polarization factor and temperature factor affect the relative Intensity?

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6. Describe the following applications of X-Rays.

a) Phase diagram determination for binary alloys. b) Retained austenite estimation

or

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a) Derive an extrapolation function for precise lattice parameter determination.

b) With the help of XRD how do you identify the phases?

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