

B. Metallurgical Engineering, 4thYr. 2nd Sem. Examination, 2017

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) State the differences between continuous radiation and characteristic radiation.
b) Why isn't it possible to get a strictly monochromatic X-Ray by filtration?
c) Draw energy level diagram of an atom to show the excitation processes and develop an expression for λ (K_{α}) radiation. 20

2. What is Diffraction? Derive Bragg's Law. What is non ideal Diffraction? Derive Scherrer's Formula and calculate the particle size. 20

3. a) How can you estimate the Miller indices of a pole in a standard projection? Justify the method. 2+5
b) What is reciprocal lattice? State its properties and prove them. Apply RL concept to Powder diffraction pattern and explain the importance of sphere of reflection, limiting sphere and calculate the total number of reflections. 2+4+5+2

4. What is atomic scattering factor? Derive an expression for Lorentz-Polarization factor. Explain briefly the absorption factor. 20

5. a) Explain the method of indexing patterns for a face centered cubic crystal.
b) Derive an extrapolation function for precise lattice parameter determination. 20

[Turn over

6. Describe the following applications of X-Rays.

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

20

7. Write short notes on the following (Any four).

- a) Application of TEM and SEM b) Camera constant in TEM c) Resolution in TEM.
d) EDAX analysis e) Secondary and back reflection mode in SEM

20