

M.E. METALLURGICAL ENGINEERING FIRST YEAR FIRST SEMESTER EXAM 2025**Subject: CHARACTERIZATION OF MATERIALS****Time: 3 hours****Full Marks: 100****Answer any four (4) questions.**

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| 1 | What is the dependence of short wave length limit on voltage? Derive Bragg law of x ray diffraction. Differentiate: Laue, rotating crystal and powder diffraction methods. | 8+8+9 |
| 2 | Differentiate: Reflection and diffraction. What is the method to measure lattice parameter using x ray diffraction? What is the controlling factor in the intensity of the characteristics x ray spectrum? | 8+12+5 |
| 3 | What is atomic scattering factor? What is structure factor? Determine the structure factors of body centered cubic and face centered cubic crystals. What is the use of structure factor? | 3+3+
8+8+
3 |
| 4 | What are the uses of dilatometer and resistivity in determination of the phase diagram? What are the methods to determine the enthalpy, entropy and free energy of any chemical reaction? | 8+5+12 |
| 5 | Draw the image formation in transmission electron microscopy. What is bright field imaging? What is dark field imaging? What is the reason for requirement of very thin specimen (thickness: 100 nm) in transmission electron microscope? | 10+5
+5+5 |
| 6 | What are the techniques of specimen preparation in transmission electron microscopy? What is chromatic aberration? What is spherical aberration? | 15+5
+5 |