

**M.E. METALLURGICAL ENGINEERING
FIRST YEAR
SECOND SEMESTER EXAM 2025**

Subject: CHARACTERISATION OF MATERIALS

Time: 3 hours

Full Marks: 100

Answer any four (4) questions.

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| 1 | The lattice parameter of Copper is 0.361 nm. The characteristic wave length of Copper $K\alpha$ X ray is 0.154 nm. What are the angles of X ray diffraction? What are the errors in lattice parameter measurements? Derive the relationship between real lattice and reciprocal lattice. | 15+3+7 |
| 2 | What is zone axis? Derive Zone law. What are the characteristics of the reference material in differential thermal analysis, thermo gravimetric analysis and differential scanning calorimetry? What is short wavelength limit? | 6+8+6+
5 |
| 3 | What is the use of etching? What is the method to quantify the amount of phases? What are the ways to determine the efficiency of a chemical reaction? | 5+10
+10 |
| 4 | What are the differences in surface characterization using scanning electron microscopy and atomic force microscopy? What are the procedures to measure the coating thickness and chemical composition of the coating? | 12+13 |
| 5 | What are the uses of back scatter electrons in scanning electron microscopy? What are the uses of atomic force microscopy in determination of mechanism of phase transformation? | 13+
12 |
| 6 | What are the uses of stereographic projections? Draw 100 standard stereographic projection of cubic crystal. | 10+
15 |