

**B.E. METALLURGICAL AND MATERIAL ENGINEERING
FOURTH YEAR SECOND SEMESTER EXAM 2022**

SUBJECT: ADVANCED CHARACTERISATION TECHNIQUES (HONS.)

Time: 4 hours

Full Marks: 70

Answer any five (5) questions. Answers must be brief and to the point. All parts of the same question must be answered contiguously.

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| 1 | What are the objectives of the use of thermal analysis techniques? Compare and contrast: differential thermal analysis and thermogravimetric analysis. | 6+8 |
| 2 | How can dilatometer generate the phase diagram? How is differential scanning calorimetry used to estimate specific heat capacity? | 8+6 |
| 3 | How can the amount of trace element be measured using atomic absorption spectrometry (AAS)? What is the use of graphite furnace in AAS? | 9+5 |
| 4 | How does atomic force microscopy (AFM) characterize the surface roughness? Can AFM require vacuum? | 10+4 |
| 5 | Differentiate: energy dispersive spectroscopy and wave length dispersive spectroscopy. What is the influence of the operating voltage in energy dispersive spectroscopy? | 10+4 |
| 6 | Why is monochromatic light needed in spectroscopy? What is the use of fourier transformation in spectroscopy? | 7+7 |
| 7 | What is the need of 200 kV operating voltage in transmission electron microscope (TEM)? Why does a specimen used in TEM contain a hole? Why is a thin specimen used in TEM? | 6+4+
4 |