

2054

M. Tech. (Micro-Electronics)
Second Semester

MIC-201: Measurement and Characterization Techniques

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Section. Use of scientific calculator is allowed.

x-x-x

Q1. Answer the following:-

- (a) What is a useful magnification? Why simply magnifying objects is not enough to keep revealing fine details? (2)
- (b) What is the imaging resolution achieved in the latest SEM? (2)
- (c) How can we briefly describe the fluorescence and Auger effect? (2)
- (d) What is electron diffraction used for? (2)
- (e) Why Auger peaks in XPS spectrum represent Kinetic energy of Auger energy? (2)

SECTION A

- Q2. (a) Discuss the effect of magnetic field on electric current using Corbino disc. (5)
- (b) Discuss the Ion Milling technique for thinning the samples. (5)
- Q3. (a) Explain the difference between XPS and AES along with kinetic energy calculations for each. (5)
- (b) What kind of samples can be analysed by AFM? What are the applications of AFM? (5)
- Q4. (a) Which technique is used to determine the sheet carrier density by measuring the voltage generated transversely to the current flow direction in a semiconductor sample when a magnetic field is applied perpendicularly? (5)
- (b) Prove that the resistivity in Vander Pauw technique is given by – (5)

$$\rho = \frac{\pi t}{\ln 2} R$$

SECTION B

- Q5. (a) How the crystal quality of epitaxial layer is monitored during its growth using Reflection High Energy Electron Diffusion? (5)
- (b) How the current in the sample is measured using Electron-beam induced current method? (5)
- Q6. (a) How the EBIC technique can be used to evaluate minority carrier properties and defect populations. (5)
- (b) What is the role of SIMS and RBS techniques in the development of advanced metallization systems for microelectronic applications? (5)
- Q7. (a) What is the difference between Auger electrons and x-ray electrons? (5)
- (b) What is absorption and transmission spectra in UV-VIS spectroscopy? Discuss their significance. (5)

x-x-x