

35132

M.Sc. DEGREE EXAMINATION, OCTOBER/NOVEMBER 2019

THIRD SEMESTER

Material Science and Nano Technology

Paper II — SEMICONDUCTORS AND DEVICES

Time : Three hours

Maximum : 75 marks

(No additional sheet will be supplied)

PART A — (5 × 3 = 15 marks)

Answer any FIVE questions.

Each question carries 3 marks.

Each answer should not exceed 1 page.

1. Distinguish between intrinsic and extrinsic semiconductors.
2. Explain the Einstein relation.
3. What are the different scattering mechanisms?
4. Write a note on Electron – Lattice interaction.
5. What are the applications of breakdown diodes?
6. Explain the I-V characteristics of real diodes.
7. What are the Ebers – Moll equations?
8. What are the four regions of operation of a BJT?

PART B — (4 × 15 = 60 marks)

Answer ALL questions.

Each question carries 15 marks.

Each answer should not exceed 6 pages.

9. Derive the expressions for position of Fermi levels and carrier concentrations in semiconductors.

Or

10. (a) Distinguish between the direct and indirect band gap semiconductors.
(b) What are the continuity equations?

11. Discuss the Somerfield model. What are its consequences?

Or

12. Derive the expression for thermal and electrical conductivities in metals.

13. Discuss the built-in voltage, electric field and potential distributions. Derive an expression for Depletion Layer capacitance.

Or

14. (a) What is an ideal diode? Derive the ideal diode equation.

(b) Distinguish between the zener and avalanche breakdown.

15. Explain the principle of operation of a BJT. Discuss the carrier recombination in the emitter-base junction depletion region of Real transistors.

Or

16. What is JFET? Explain its principle of operation.

