C 15649

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FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2011

EC 09 406/PTEC 09 405—SOLID STATE DEVICES

(2009 Admissions)

Time : Three Hours

Maximum : 70 Marks

Part A (Short Answer Questions)

1. What is meant by low-level injection condition in semiconductors ?

2. What is ohmic contact ?

3. What is Pich-off voltage ?

4. What is meant by transistor breakdown ?

5. What are the different types of power diodes ?

$(5 \times 2 = 10$ marks)

Part B

Answer any **four** *questions.*

6. Derive the expressions for charge concentrations of semiconductor doped with both pentavalent and trivalent impurities.

7. Derive the operating point for a forward biased PN junction diode.

8. With circuit diagram explain and write the expressions for terminal currents in NPN BJT.

9. Explain with circuit diagram how BJT acts as a switch.

10. Explain the substrate bias effects in MOSFET.

11. Explain the short-channel effects in MOSFET.

$(4 \times 5 = 20$ marks)

Part C

12. (a) Derive the expression for Fermi level in *p*-type semiconductor.

    Or

    (b) Derive the expression for drift current in semiconductor interms of charge concentrations.

13. (a) Derive the expression for diffusion capacitance in PN junction.

    Or

    (b) Derive the PN junction diode current equation.

Turn over

14. (a) Explain with circuit diagram how transistor works with timing diagrams.

Or

(b) Explain the working of n-channel JFET and its drain and transfer characteristics.

15. (a) Explain with diagrams the working and characteristics of n-channel enhancement MOSFET.

Or

(b) Explain the operation of SCR with two transistor model and draw its characteristics.

(4 × 10 = 40 marks)