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FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION
APRIL 2013

EC 09 406/PTEC 09 405—SOLID STATE DEVICES

(2009 Scheme)

(Regular/Supplementary/Improvement)

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Short answer questions.

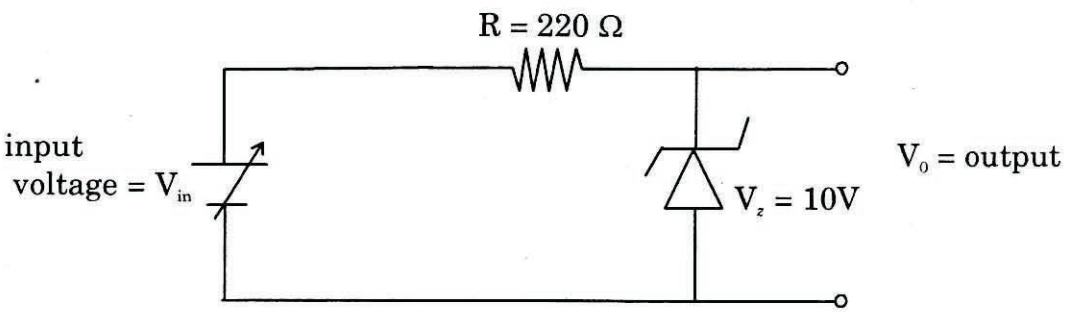
1. What is Fermi level ?
2. State Einstein's relation.
3. Why JFET is called voltage controlled device ?
4. What is base-width effect in BJT ?
5. Write in brief the significance of threshold voltage of MOSFET.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. Derive the expression for electron and hole concentration of semiconductor doped with trivalent impurity.
7. Derive the expression for diffusion current in semiconductors.
8. A constant 10V Zener diode with R = 220 Ω as shown in the circuit below has I_{min}= 0.25 mA and I_{max} = 100 mA. Find the range of input voltage over which the output is regulated.



Turn over

9. Explain the operation of n-channel JFET.

10. Draw the structure of power MOSFET and explain its operation.

11. Explain the working of MOS capacitor with diagram.

(4 × 5 = 20 marks)

Part C

12. (a) Explain with neat diagrams direct and indirect bandgap in semiconductors.

Or

(b) Derive the expression for conductivity and mobility in intrinsic semiconductors.

13. (a) Derive the expression for space-charge capacitance in PN junction.

Or

(b) Explain the construction, working and characteristics of tunnel diode with neat diagrams.

14. (a) Explain the construction and working of hetero junction bipolar transistors.

Or

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

15. (a) Explain the construction, working and characteristics of p-channel E-MOSFET with diagrams.

Or

(b) Explain the different methods of turning-off SCR.

(4 × 10 = 40 marks)