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F – 2208

Reg. No. : .....

Name : .....

Third Semester B.Tech. Degree Examination, December 2018
(2008 Scheme)
08.302 : SOLID STATE DEVICES (TA)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions. **Each** question carries **4** marks.

1. With neat diagrams, explain Fermi Dirac statistics applied to semiconductors.
2. Explain the dependence of mobility on temperature and carrier concentration.
3. What are direct band gap semiconductors ? Explain with figure.
4. Explain the temperature dependence of VI characteristics of a pn junction diode.
5. Explain early effect. What are the consequences of early effect on the parameters and the characteristics of BJT ?
6. Draw the Ebers Moll model of a pnp BJT and write the equations. Explain the terms involved.
7. Explain Kirk effect.
8. Explain the body effect.
9. Draw the equivalent circuit of UJT and explain the terms.
10. List the advantages and disadvantages of IGBT. **(10×4=40 Marks)**

P.T.O.

PART – B

Answer **any two** questions from **each** Module. **Each** question carries **10** marks.

Module – I

11. What is Hall effect ? Derive the expression for Hall co-efficient.

12. Derive Einstein's equation.

13. A Si sample is doped uniformly with 10^{15} As atoms/cm^3 and has $\tau p = 1\mu s$. Determine the photo generation rate that will produce 2×10^{13} cm^{-3} excess EHPs in the steady state. Also calculate the conductivity of the sample and position of the electron and hole quasi Fermi levels in the steady state condition at 300 K.

Module – II

14. Draw the minority carrier distribution and the current components in a forward biased pn junction. Show that the depletion region extends more into the lightly doped region of a pn junction.

15. Derive the ideal diode current equation. State the assumptions used.

16. Derive the expression for emitter current and collector current of an npn BJT. State the approximations used.

Module – III

17. Explain the C-V characteristics of a MOS capacitor with the help of space charge density vs. surface potential diagram.

18. Derive the expression for drain current of a MOSFET.

19. A silicon n channel MOSFET has $\mu_n = 600$ cm^2/V sec, $Cox = 1.2 \times 10^{-7}$ F/cm^2, $W = 50$ μm, $L = 10$ μm and $V_{TH} = 0.8$ V. Find the Drain current when

i) VGS = 2V and VDS = 1V

ii) VGS = 3V and VDS = 5V.

(6×10=60 Marks)