

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI
EE205 ELECTRON DEVICES

Branch: EEE III SEM I Cycle Test

Max marks:20

Date :03.09.2014

Duration:3.00p.m-4.00p.m

1. When does reverse breakdown occur in a diode? (1)
2. What is the range of operation of a PN junction diode when forward biased? (1)
3. Write down the applications, advantages and disadvantages of tunnel diode. (3)
4. A zener diode has a $V_z = 7.5V$ and a $Z_z = 5\Omega$ at a certain current. Draw the equivalent circuit. Draw the V-I characteristics of Zener diode and explain its operation. (4)
5. Each diode is described by linearized volt-ampere characteristics, with incremental resistance r and offset voltage V_y . In fig.1 diode D1 is made of germanium with $V_y = 0.2V$ and $r = 20\Omega$, and D2 is made of silicon with $V_y = 0.6V$ and $r = 15\Omega$, find the diode current if (a) $R = 10k\Omega$, (b) $R = 1k\Omega$. (2)

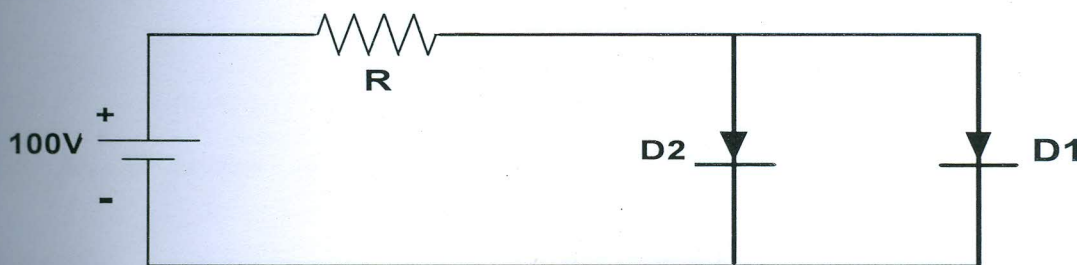


Fig-1

6. If resistivity of the p material is $3.5\Omega\text{cm}$, the barrier height V_0 is $0.35V_v$, the applied reverse voltage is $5V$, and diameter of cross section is 40mm , assume $\xi = 1.04 \times 10^{-12} \text{ F/cm}$, $\mu_p = 1800 \text{ cm}^2/\text{v-sec}$. Find C_T . (2)
7. Find the concentration of holes and electrons in N-type silicon at $300K$ if the conductivity is $0.1(\Omega\text{-cm})^{-1}$ (2)
8. (a) Neglecting the effect of carrier generation and recombination in the space-charge region, find an expression for the capacitance of an ideal $p-n$ junction diode in which the doping concentrations of the p and n -sides are comparable to each other. (2)
- (b) Express the diffusion capacitance of part (a) in terms of the electron and hole currents $I_{np}(0)$ and $I_{pn}(0)$ respectively. (1)
- (c) Verify the validity of Equation using the charge control model of the $p-n$ junction diode of part (a). (1)
- (d) How can you modify the result of parts (a) and (b) to obtain the diffusion capacitance of a practical diode where the current-voltage relation is described? (1)