Test -III Question Paper

Answer all the questions

1. (a). Explain the formation of built-in potential barrier in an un-biased PN junction and hence derive the expression for built in potential in an un-biased PN junction.   (3 M)

   (b). A silicon PN junction is at T = 300 K with doping densities Na = 1 X 10^{18} cm^{-3}, N$_v$ = 1 X 10^{15} cm^{-3} and n$_i$ = 1.5x10^{10} cm^{-3}. Calculate the built-in potential in PN junction.   (2M)

2. (a). What is a compensated semiconductor? Deduce the expressions for electron and hole concentrations in a compensated semiconductor.   (3 M)

   (b). If mobility of a particular carrier is 1000 cm^2/V-s at T=300 K, then determine the diffusion   coefficient   of   the   carrier.
   (2 M)

3. (a). Define density of states function and hence deduce an expression for it.   (3 M)

   (b). Calculate thermal equilibrium hole concentration in silicon at T = 400 K. Assume that the Fermi energy is 0.27 eV above the valence band energy. The value of N$_v$ for silicon at T = 300 K is N$_v$ = 1.04 x 10^{19} cm^{-3}.   (2 M)

4. (a). Compare the working conditions of BJT and FET.   (3 M)

   (b). In a common base connection of a BJT, if current amplification factor is equal to 0.95 and if voltage drop across 3KΩ resistance connected in collector circuit is 2V, find the base current.   (2 M)

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