Roll No .....

MEVD - 204

M.E./M.Tech., II Semester

Examination, December 2015

Microelectronics

Time : Three Hours

Maximum Marks : 70

Note : i) Attempt any five questions.
ii) All questions carry equal marks.

1. What is quantum mechanics theory and What are the properties of photons?

2. A pulse of radiation consisting of 5×10^4 photon's of $\lambda=3000A^\circ$ falls on a photosensitive surface whose sensitivity for this wavelength region is J=5mA/W. Find the number of photoelectrons liberated by the pulse.

3. a) What are bonds in a solid?
   b) Deduce the expression for bond energy in general.

4. Write an equation for the net electron current in a semiconductor and give the physical significance of each term.

5. a) Describe recombination theory.
   b) Define mean life time of a carrier.

6. a) Explain Drift and Diffusion of charge carriers in semiconductors. Derive an expression for the electron current due to drift and diffusion.
   b) Distinguish between Majority and Minority carriers in a semiconductors. Define mobility charge carriers.

7. a) The intrinsic resistivity of silicon at 27°C is 2.8×10^3 Ωm. The electron and hole mobilities are 0.38 and 0.18 m^2/v-s respectively. Calculate intrinsic carrier density at the given temperature.
   b) Distinguish between transition and diffusion capacitance of a P-N Junction theory. Derive an expression for the diffusion capacitance C_D. How does C_D Vary with the diode current?

8. a) Consider a Ge diode with $N_D = N_A$ and with impurity concentration of $8\times10^{14}/cm^3$. Assume $n_i = 2\times10^{13}/cm^3$ At room temperature of 300°K. Calculate the height of the potential barrier under open circuit conditions. Assume Boltzmann's constant $K = 8.61\times10^{-5}$ev/°C and electron charge $q = 1.6\times10^{-19}$ C.
   b) Write a note on any one of the following :
      i) Non-uniformly doped transistors
      ii) Ebers - Moll and small signal models

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