MID SEM – 2 (Physics-II PHIC 103)

B.Tech (1st year: 2nd Semester) Time Allowed: 50 min. Max. Marks: 20

NOTE: Attempt all the questions. Extra ANSWER SHEETS will NOT be supplied.

1. Define drift speed and mobility of charge carriers in a semiconductor. Discuss the temperature effect on mobility with relevant graph. [6]

2. Consider an n-type GaAs sample at T = 300 K with $N_d = 10^{16}$ cm^{-3}. If $\mu_n = 8500$ cm^2/V-s and $\mu_p = 400$ cm^2/V-s. Estimate the drift current density and conductivity when the applied electric field is E = 10 V/cm. [4]

3. Sketch a neat and well labelled band diagram for PN-homojunction under equilibrium. Also show the charge carrier density, Electric field and Electric potential profile for the unbiased situation. No description required. [6]

4. Calculate the built-in voltage V_{BI} in a silicon PN junction at T = 300 K with doping concentrations $N_a = 2\times10^{17}$ cm^{-3} and $N_d = 10^{15}$ cm^{-3}. The intrinsic carrier concentration for Silicon is 1.5×10^{10} cm^{-3}. [4]