MID SEM – I (Physics-II PHIC 103)

.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. In the Kronig - Penny model, $\mathbf{P \sin \alpha a/\alpha a + \cos \alpha a = \cos ka}$, show that for $P << 1$, the energy of the lowest energy band is $E = \hbar^2 P/ma^2$. [6]

2. Discuss the physical significance of effective mass. Prove that the effective mass is **1.5** times greater than the actual mass m when E - k relationship is $E = \hbar^2 k^2/3m$. [4]

5. Silicon crystallizes as the diamond structure with lattice constant **5.43** Å. Calculate the areal atomic density crystal planes **(1 0 0)**, **(1 1 0)** and **(1 1 1)**. [6]

3. For intrinsic semiconductor at non-zero absolute temperature, show that the Fermi energy level is not located in the mid of the band gap. [4]