National Institute of Technology Srinagar

Department of Electronics & Communication Engineering

Assignment – I : Review of Semiconductor Physics

ECEM – 224 (Physical Electronics - II)   **Session:** Spring 2020

Course Professor: Sheikh Aamir Ahsan   **Maximum Marks**: 10

Q1. Qualitatively plot $\partial f(E)/\partial E$ as a function of energy at T = 0 K and at finite temperature T = 300 K. Explain the features in the plot. Here, $f(E)$ denotes the Fermi-Dirac function.   [01 Marks]

Q2. For a p-type doped semiconductor with acceptor concentration N_A plot the Fermi-Dirac function $(\mathcal{F}_{1/2}(\eta))$ vs η on a semilog scale where $\eta = (E_f - E_c)/kT$. Also plot the Boltzmann function (e^{η}) on the same graph. Indicate how the two differ from each other.   [02 Marks]

Q3. Derive the expression for density of states function $g_{2D}(E)$ for a 2D material with $E - k$ relationship given as $E = \alpha k^2$, where α is a positive real constant.   [07 Marks]

Please send the finished assignment PDF copy to Mr. Shivendra Kumar Singh at shivkumar0401@gmail.com. I will directly collect them from him.