

## Homework-3 (Semiconductor devices)

[Due: April 4th 2024, Thursday.]

1. Derive the expression for the built-in voltage of a p-n diode.
2. Derive the expression for the depletion widths along n-side and p-side of a p-n junction
3. Stating all the assumptions, derive the Shockley diode equation.
4. For a Silicon p–n junction, the p-side has a doping density of  $10^{16}/\text{cm}^3$ , and the n-side has a doping density of  $10^{17}/\text{cm}^3$ . Plot the charge density, electric field, electric potential and depletion regions on both p and n side. You can use Matlab, Mathematica or any programming language of your choice to generate the plots. For any missing parameters, refer your text book.