Homework #3
Computational Microelectronics

Seongpyo Hong

Due on October ?, 2018

1 Results

We have solved the Poisson equation of the heterogeneous structure. We have considered GaAs/GaP heterostructure of the thickness, 10 nm and 20 nm respectively. Each has the relative permittivity 11.1 and 12.9, respectively. Note that we have the boundary conditions given by

$$\phi(x = 0) = 0,\ \phi(x = 30\text{ nm}) = 1.0. \tag{1}$$

The numerical results are provided in Table 1. One can also check the results by running the Python code provided. By the formula about the capacity and the potential ϕ

$$Q = C\phi\,, \tag{2}$$

we should have the relationship between the two layers by

$$\frac{\phi_1}{\phi_2} = \frac{C_2}{C_1} \equiv k\,. \tag{3}$$

Running the code, we obtain the ratio $k = 0.5811$ from the ratio of ϕ and C. Fig. 1 provides ϕ as a function of position.

Table 1: Analytically obtained capacity and numerically obtained potential at each layer. The total capacitance is also provided.

	Capacity (F/cm^2)	ϕ (Arbitrary unit)
GaAs	9.824e-07	0.368
Gap	5.708e-07	0.632
Total	3.610e-07	1

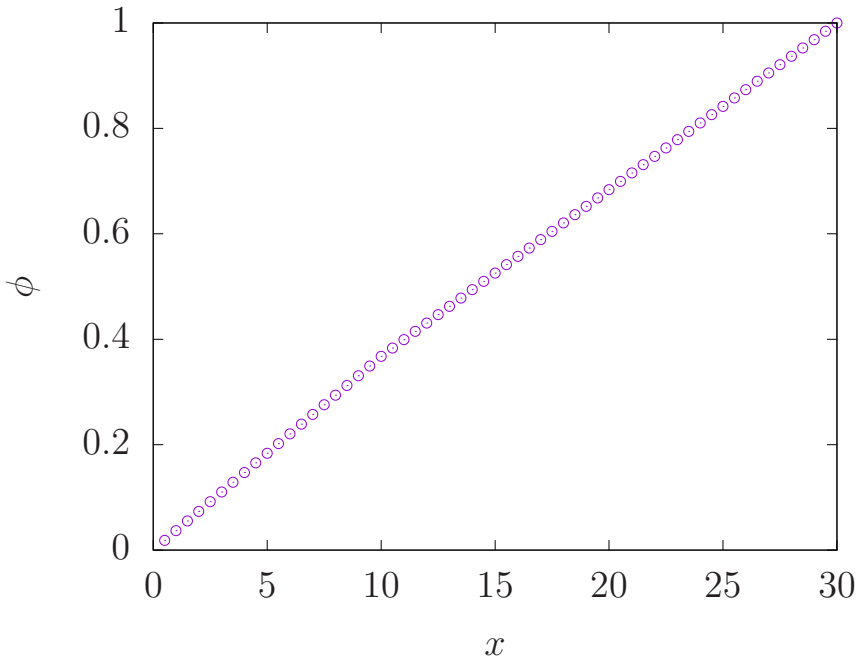

Figure 1: The potential obtained from the Poisson equations.