Greg Kiar 02/25/2015

SBE II: Homework 4

Experiment-1:

Given that we know the following:

$$\lambda^2 \frac{\partial^2 V}{\partial x^2} = \tau \frac{\partial V}{\partial t} + V$$
$$V(x, t = 0) = 0$$
$$I_i(x = 0, t) = I_0(t)$$
$$I_i(L) = 0$$

We are asked to derive the spatial boundary conditions.

From the above, we know that at the initial condition $\frac{\partial V}{\partial t}$ and V are both 0.

We then have the following:

$$\lambda^2 \frac{\partial^2 V}{\partial x^2} = 0$$
$$\frac{\partial^2 V}{\partial x^2} = 0$$
$$\left.\frac{\partial V}{\partial x}\right|_x = V(x, t) = -r_i I_i(x, t)$$

Now, we can solve for the two boundaries, when $x = 0$ and $x = L$:

$$\left.\frac{\partial V}{\partial x}\right|_{x=0} = -r_i I_0(t)$$
$$\left.\frac{\partial V}{\partial x}\right|_{x=L} = -r_i I_i(L) = 0$$