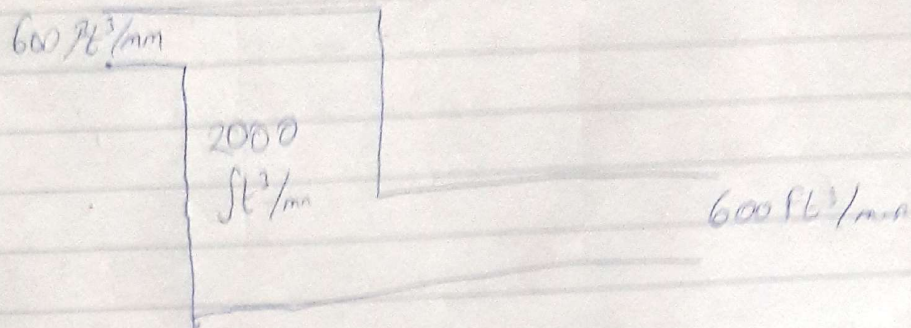


Hacina Muhammad  
 16/ENG04/023  
 Elect/Elect  
 ENG 282



$$\frac{dy}{dt} = y_{in} - y_{out}$$

$$y_{in} = 600$$

$$y_{out} = 600/2000 = 0.03y$$

$$dy/dt = 600 - 0.03y$$

$$dy/dt = -0.03(y - 20,000)$$

$$\int \frac{dy}{y - 20,000} = \int -0.03 dt$$

$$\ln(y - 20,000) = -0.03t + c$$

$$y - 20,000 = e^{-0.03t + c}$$

$$y - 20,000 = y_0 e^{-0.03t}$$

$$y = y_0 e^{-0.03t} + 20,000$$

a) At  $t=0$ ;  $y=0$

$$y = y_0 e^{-0.03t} + 20,000$$

$$0 = y_0 e^{-0.03(0)} + 20,000$$

$$y_0 = -20,000$$

$$y = 20,000 e^{-0.03t} + 20,000$$

$$b) 90\% \times 20,000 = 18,000$$

$$y = 18,000$$

$$18,000 = -20,000 e^{-0.03t} + 20,000$$

$$18,000 - 20,000 = -20,000 e^{-0.03t}$$

$$0.1 = e^{-0.03t}$$

$$\ln(0.1) = -0.03t$$

$$t = -2.30 / 0.03$$

$$t = 76.8 \text{ min}$$