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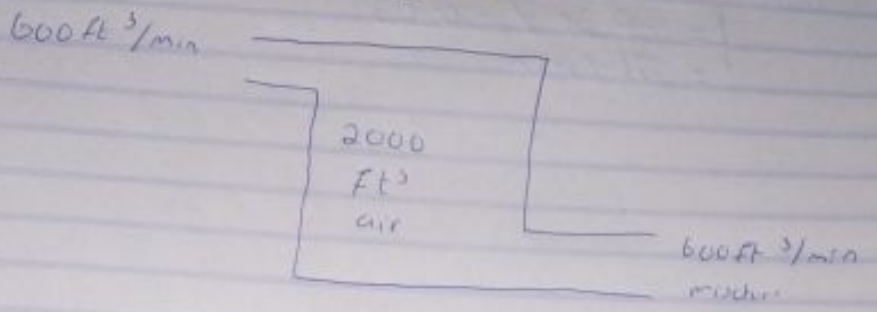
Mechatronics
16/SNG05/1009
ENG 282

Assignment



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

$$Y_{in} = 600$$

$$Y_{out} = \frac{600}{20000} = 0.03y$$

$$\frac{2y}{2t} = 600 - 0.02y$$

$$\frac{\partial y}{\partial t} = -0.03(y - 20000)$$

$$\int \frac{2y}{(y-20000)} = \int -0.032t$$

$$\ln(y - 20000 = -0.03t + c$$

$$y - 20000 = e^{-0.03t+c}$$

$$y - 20000 = y_0 e^{-0.03t}$$

$$Y = y_0 e^{-0.03t} + 20000$$

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

$$y = y_0 e^{-0.03t} + 20000$$

$$0 = y_0 e^{-0.03(0)} + 20000$$

$$\therefore y_0 = -20000$$

$$Y = -20000 e^{-0.03t} + 2000 \quad \cdots \text{model}$$

b) $90\% \times 20000 = 18000$

$$y = 18000$$

$18000 = -20000e^{-0.03t} + 20000$

$18000 - 20000 = -20000e^{-0.03t}$

$0.1 = e^{-0.03t}$

$\ln(0.1) = -0.03t$

$t = -2.30 / -0.03$

$t = 76.8 \text{ min}$