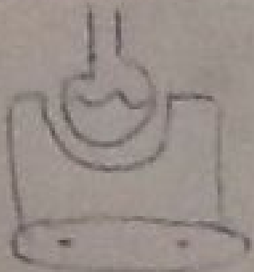
ENTREGA 2



$$\Delta Q = hA\,(T - T_\infty) + V\rho\, C_p \cdot \frac{dT}{dt}$$

$$\Delta Q + hA\,(T_\infty - T) - V\rho\, C_p \frac{dT}{dt} = 0$$

$$t = 0 \rightarrow T = T_0 \qquad Q = Q_0 \,,\; \frac{dT}{dt} = \frac{d\cancel{T_0}}{dt}^{\,0}$$

$$Q_0 + h\cdot A(T_\infty - T_0) - 0 = 0$$

$$T = T$$

$$T = T_0 + \Delta T$$

$$Q = Q_0 + \Delta Q$$

$$\frac{dT}{dt} = \frac{d\cancel{T_0}}{dt}^{\,0} + \frac{d\Delta T}{dt}$$

$$Q_0 + \Delta Q + hA(T_\infty - T_0 + \Delta T) - V\rho\, C_p \frac{dT}{dt} = 0$$

$$Q_0 + hA\,(T_\infty - T_0) + \Delta Q + hA\cdot\Delta T - V\rho\, C_p \frac{d\Delta T}{dt} = 0$$

$$\Delta Q = hA\,\Delta T + V\rho\, C_p \frac{d\Delta T}{dt}$$

$$\frac{\Delta Q}{hA} = \Delta T + \left(\frac{V\rho C_p}{hA}\right) \cdot \frac{d\Delta T}{dt}$$

$$K = \frac{1}{hA} \qquad \tau = \frac{V\rho C_p}{hA}$$

$$K\cdot\Delta Q = \Delta T + \tau\,\frac{d\Delta T}{d\tau} \rightarrow K\,\mathcal{L}[\Delta Q] = \mathcal{L}[\Delta T] + \tau\,\mathcal{L}\left[\frac{d\Delta T}{dt}\right]$$

$$\frac{K}{s}\,\Delta Q = \Delta T + \tau\cdot s\cdot\Delta T$$

$$\Delta T\cdot(1 + \tau s) = \frac{K}{s}\,\Delta Q \rightarrow \Delta T = \frac{K\cdot\Delta Q}{s\,(1+\tau s)} = \frac{K\cdot\Delta Q}{\tau s\left(\frac{1}{\tau} + s\right)}$$

$$\boxed{\Delta T = \frac{K\,\Delta Q}{\cancel{\tau}}\,\cancel{\tau}\,\left(1 - e^{-\frac{t}{\tau}}\right)}$$