For imprement the transilent heat conduction:

$$\rho c_p \frac{\partial T}{\partial t} + k\frac{\partial^2 T}{\partial x^2} = 0$$: constant k= 400, rho = 870, Cp= 38.5

IC:

$$T_o = 293.15$$

BC:

$$\frac{\partial T}{\partial x}\Big|_{x=0} = 0 \text{ and } \frac{\partial T}{\partial x}\Big|_{x=L} = h(T_\infty - T)$$

Weak Form

$$\int_o^L v \cdot \rho c_p \frac{\partial T}{\partial t}dx + \int_o^L v \cdot k\frac{\partial^2 T}{\partial x^2}dx = 0$$

Bypart intrigation

$$\int_o^L v \cdot \rho c_p \frac{\partial T}{\partial t}dx + \left[v \cdot k\frac{\partial T}{\partial x}\right]_0^L - \int_o^L k\frac{\partial v}{\partial x}\frac{\partial T}{\partial x}dx = 0$$

$$\int_o^L \left[v \cdot \rho c_p \frac{\partial T}{\partial t} ++ k\frac{\partial v}{\partial x}\frac{\partial T}{\partial x}\right]dx + \left[v \cdot h(T_\infty - T)\right]_L - [0]_0 = 0$$

Domain setting
dweak
T_test*rho*cp*T_time

weak
k*Tx_test*Tx

Boundary setting
point 1
0
point 2
T_test*h*(850-T)