$$q_{cond} = -kA\frac{\Delta T}{\Delta X} = -\frac{\Delta T}{\left(\frac{\Delta x}{kA}\right)} \rightarrow R_{e\,cond}$$

$$q = \frac{\Delta T}{R_{eq}}$$

$$q_{conv} = hA_s(T_s - T_f) = \frac{\Delta T}{\left(\frac{1}{hA_s}\right)} \rightarrow R_{eq\,conv}$$

$$q_{rad} = h_r(T_s, T_a) \cdot A_s \cdot (T_s - T_a) = \frac{\Delta T}{\left(\frac{1}{h_r A_s}\right)} \rightarrow R_{eq\,rad.}$$

$$q = UA\,\Delta T$$

$$q = \frac{\Delta T}{R_{eq}}$$

$$UA\Delta T = \frac{\Delta T}{R_{eq}}$$

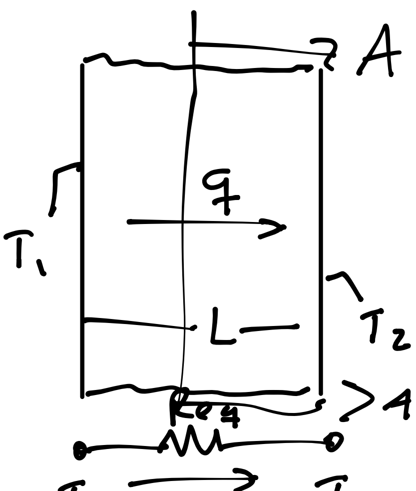
$$UA = \frac{1}{R_{eq}}$$

$$U [=] \frac{W}{m^2 \cdot K}$$

$$R_{eq} [=] \frac{K}{W}$$

$$UA [=] \frac{W}{\cdot K}$$

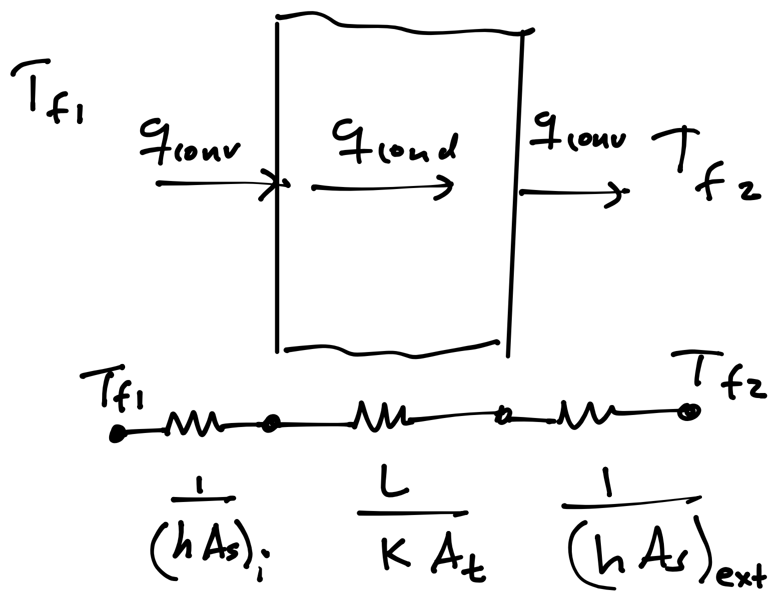
$$W = \frac{\cdot K}{\frac{K}{W}}$$



$$i = \frac{\Delta V}{R}$$

$$q = \frac{\Delta T}{R_{eq}} = \frac{T_1 - T_2}{\left(\frac{L}{kA}\right)}$$

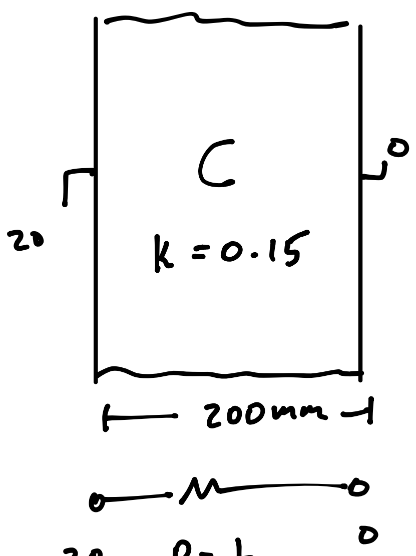
T_1 q T_2



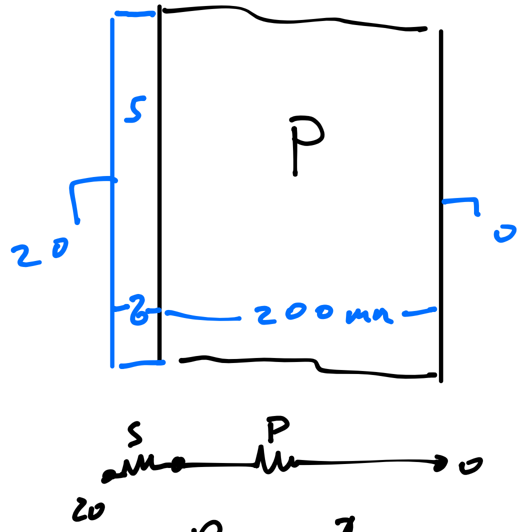
$$q = \frac{T_{f1} - T_{f2}}{\frac{1}{(hA_s)_i} + \frac{L}{KA_t} + \frac{1}{(hA_s)_{ext}}}$$

$q_{min} \equiv R_{max}$

3.2 A new building to be located in a cold climate is being designed with a basement that has an $L = 200$-mm-thick wall. Inner and outer basement wall temperatures are $T_i = 20°C$ and $T_o = 0°C$, respectively. The architect can specify the wall material to be either aerated concrete block with $k_{ac} = 0.15$ W/m·K, or stone mix concrete. To reduce the conduction heat flux through the stone mix wall to a level equivalent to that of the aerated concrete wall, what thickness of extruded polystyrene sheet must be applied onto the inner surface of the stone mix con-



$$R = \frac{L}{K A_t}$$



$$R_{eq} = \frac{b}{K_{ps} \cdot A_t} + \frac{L}{K_p \cdot A_t}$$

$$A_t = 1\,m^2$$

$$q = \frac{\Delta T}{R} = \frac{\Delta T}{R_{eq}}$$

$$R_{conc} = R_{eq}$$

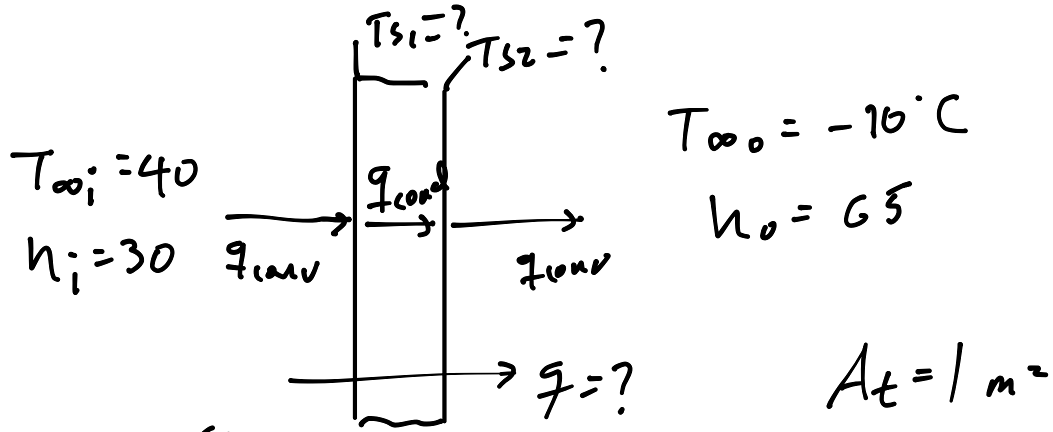
$$\frac{L}{K_c A_{\cancel{t}}} = \frac{b}{K_{ps} \cdot \cancel{A_t}} + \frac{L}{K_p \cdot \cancel{A_t}}$$

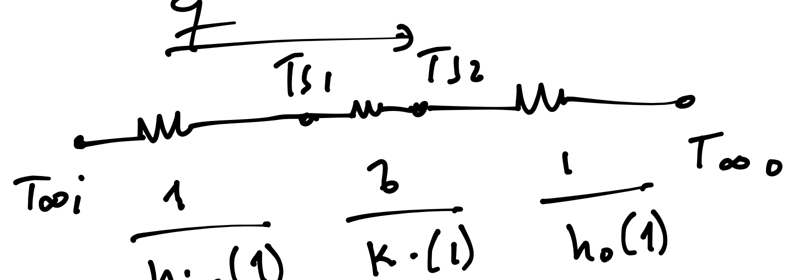
$$K_{ps} = 0.04$$

$$K_p = 1.4.$$

3.3 The rear window of an automobile is defogged by passing warm air over its inner surface.

(a) If the warm air is at $T_{\infty,i} = 40°C$ and the corresponding convection coefficient is $h_i = 30\ W/m^2 \cdot K$, what are the inner and outer surface temperatures of 4-mm-thick window glass, if the outside ambient air temperature is $T_{\infty,o} = -10°C$ and the associated convection coefficient is $h_o = 65\ W/m^2 \cdot K$?





$$R_{eq} = \frac{1}{h_i} + \frac{b}{K} + \frac{1}{h_o}$$

1) $q = \dfrac{T_{\infty i} - T_{\infty o}}{R_{eq}}$ ✓

2) $q = \dfrac{T_{\infty i} - \overset{?}{T_{si}}}{\frac{1}{h_i}}$

3) $q = \dfrac{\overset{?}{T_{s2}} - T_{\infty o}}{\frac{1}{h_o}}$