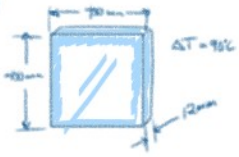
HW02

Tuesday, September 12, 2023 1:24 PM

Chapter 2:
Problems: ~~11~~, 22, 39, 50 and 52

2.11)



$$q_x = -KA\frac{dT}{dx} \rightarrow q = \frac{-KA\Delta T}{L}$$

$$q_{ag} = \frac{-(0.014)(0.4\times0.4)(90)}{(0.012)} = \boxed{-16.8\ W}$$

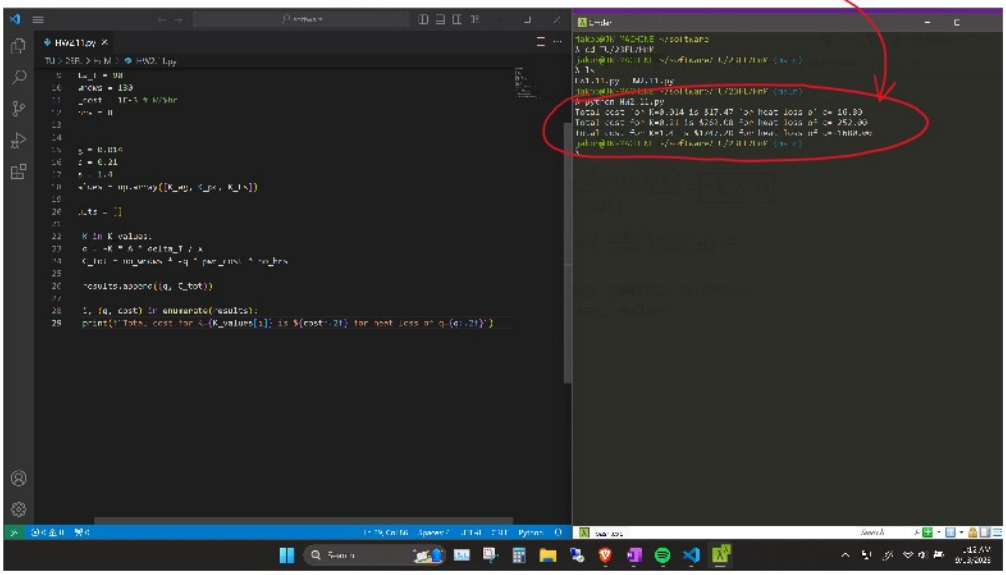
$K_{ag} = 0.014\ W/mK$

$K_{pl} = 0.21\ W/mK$

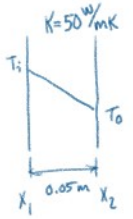
K_{LG} @ 300 K $\xrightarrow{A\text{-}3}$ $1.4\ W/mK$

$$C_{total} = (16.8)\left(\frac{1\ KW}{1000\ W}\right)(130)(8) = \boxed{\$17.47}$$

REST WERE COMPUTED IN PYTHON
SEE BELOW:



2.22)



$T(^\circ C) = a + bx^2$

$a = 200^\circ C$

$b = -2000\ ^\circ C/m^2$

FIND: $\dot{q}_{WALL}$, q @ WALL FACES

a) $$\dot{q}_{gen} = -K\left(\frac{d^2T}{dx^2}\right) = -(50)\frac{d^2}{dx^2}(200-2000x^2)$$

$$\dot{q}_{gen} = -50\frac{d}{dx}(-4000x) = -50\times-4000 = \boxed{200000\ W/m^3}$$

b) $$q''_{bx} = q_x/A = -K\frac{dT}{dx} = -(50)(-4000x) = 200000x$$

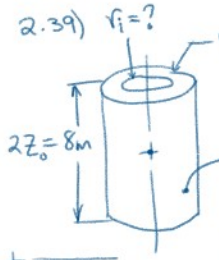
$$q''_{x_1} = 200000(0) = \boxed{0}$$

$$q''_{x_2} = 200000(0.05) = \boxed{10000\ W/m^2}$$

Q1) WHAT IS DIFF BETWEEN q & $\dot{q}$ mathematically & functionally

Q2) WHEN/WHY IS "K" OMITED?

2.39) $r_i = ?$



$$T(r,z) = -20 + 150r^2 - 12\ln r - 300z^2$$

a) $$\frac{dT}{dr} = 0 + 300r - 12/r + 0 = 300r - 12/r$$

STEADY STATE

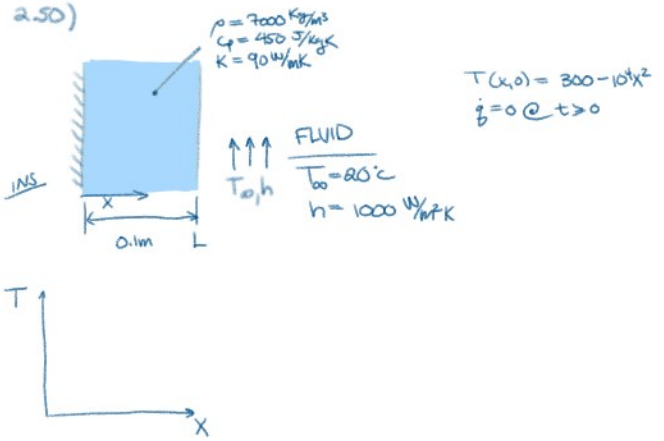
$$\frac{dT}{dr} = 0 = 300r - 12/r \rightarrow 300r = \frac{12}{r}$$

STEADY STATE

$\frac{dT}{dr} = 0 = 300r - 12/r \rightarrow 300r = \frac{12}{r}$

$r = \sqrt{12/300} = 0.2\,m$

2.50)



$T(x,0) = 300 - 10^4 x^2$

$\dot{q} = 0$ @ $t > 0$