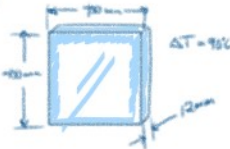


Chapter 2:
Problems: 22, 39, 50 and 52

2.11)



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

$$g_{ag} = \frac{-(0.014)(0.4 \times 0.4)(90)}{(0.012)} = -16.8 \text{ W}$$

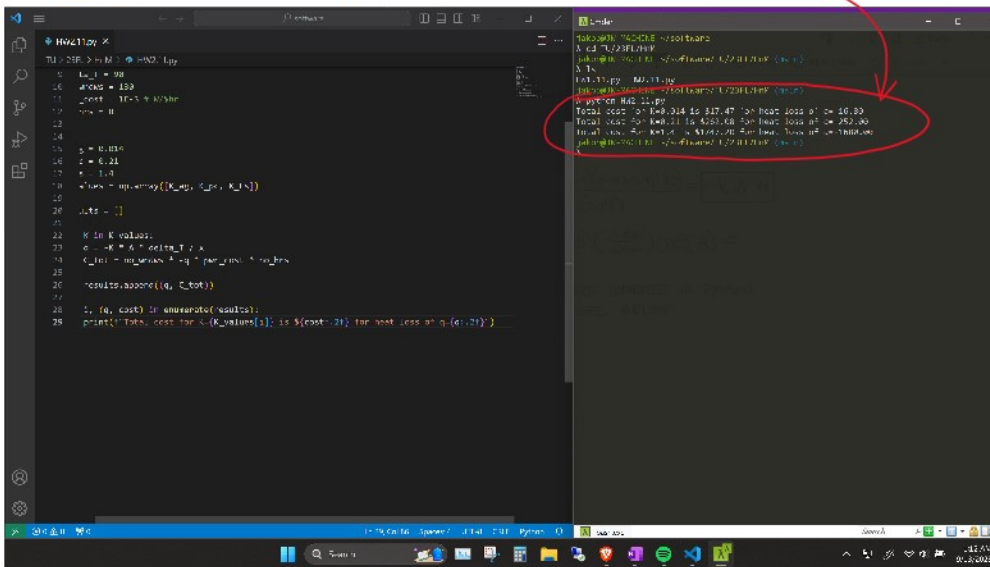
$$K_{ag} = 0.014 \text{ W/mK}$$

$$K_p = 0.21 \text{ W/mK}$$

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

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

REST WERE COMPUTED IN PYTHON
SEE BELOW:

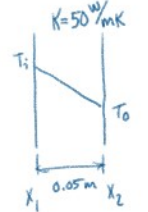


```

1 # HW02, Chapter 2, Problem 2.11
2 # Given:
3 K_ag = 0.014 # W/mK
4 K_p = 0.21 # W/mK
5 K_LG = 1.4 # W/mK
6 L = 0.012 # m
7 A = 0.4 * 0.4 # m^2
8 ΔT = 90 # °C
9
10 # Calculate heat loss q
11 q = -K_ag * A * ΔT / L
12
13 # Calculate total cost
14 C_total = (q / 1000) * 130 * 8 # $
15
16 # Print results
17 print("Total cost for K_ag = 0.014 is $17.47 for heat loss q = -16.80")
18 print("Total cost for K_p = 0.21 is $16.80 for heat loss q = -16.80")
19 print("Total cost for K_LG = 1.4 is $16.80 for heat loss q = -16.80")

```

2.22)



$$T(x) = a + bx^2$$

$$a = 200^\circ\text{C}$$

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

FIND: \dot{q}_{wall}
 g @ WALL FACES

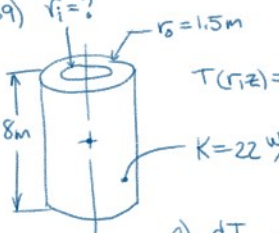
a) $\dot{q}_{gen} = -K \left(\frac{dT}{dx} \right) = -50 \left(\frac{d}{dx} (200 - 2000x^2) \right)$
 $\dot{q}_{gen} = -50 \frac{d}{dx} (-4000x) = -50 \times -4000 = 200000 \text{ W/m}^2$

b) $q''_x = \dot{q}_{gen} / A = -K \frac{dT}{dx} = -(50)(-4000x) = 200000x$
 $g''_{x1} = 200000(0) = 0$
 $g''_{x2} = 200000(0.05) = 10000 \text{ W/m}^2$

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

Q2 WHEN/WHY IS "K" OMITTED?

2.39) $r_i = ?$



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

K = 22 W/mK

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

STEADY STATE

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

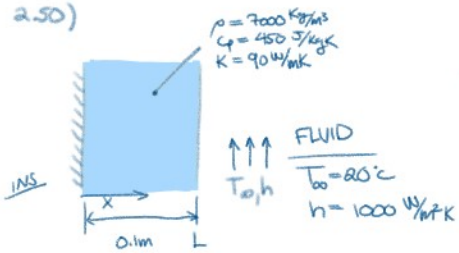


STEADY STATE

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

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

2.50)



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

$$\dot{T} = 0 \text{ @ } t \geq 0$$

