

Level 6

Thermo Marcos Gonzalez

b)

$$\dot{Q} = U A F \Delta T_{LM}$$

$$\Delta T_{LM} = \frac{\Delta T_o - \Delta T_i}{\ln\left(\frac{\Delta T_o}{\Delta T_i}\right)}$$

$$\Delta T_i = T_{H,in} - T_{C,o} = 135 - 96.68 = 38.32$$

$$\Delta T_o = T_{H,o} - T_{C,i} = 100 - 15 = 85$$

$$\frac{85 - 38.32}{\ln\left(\frac{85}{38.32}\right)} = 58.59$$

$$A = \frac{\dot{Q}}{U F \Delta T_{LM}} = \frac{14612.5}{425 \times 0.93 \times 58.59} = 0.63 \text{ m}^2$$

c)

$$C = \dot{m} \times c_p$$

$$C_H = \dot{m}_H \times c_{p,H} = 0.25 \times 1670 = 417.5$$

$$C_C = \dot{m}_C \times c_{p,C} = 0.178 \times 1005 = 178.89$$

$$C_c = C_{min}$$

$$NTU = \frac{U A}{C_{min}}$$

$$\frac{425 \times 0.63}{178.89} = 1.497$$

$$C_r = \frac{C_{min}}{C_{max}}$$

$$\frac{178.89}{417.5} = 0.428$$

$$\epsilon = \frac{1 - e^{-NTU(1-C_r)}}{1 - C_r e^{-NTU(1-C_r)}}$$

$$1 - e^{-1.497(1-0.428)}$$

$$1 - 0.428 e^{-1.497(1-0.428)}$$

$$= 0.703$$