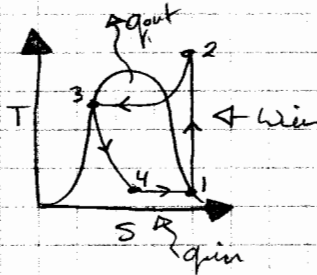
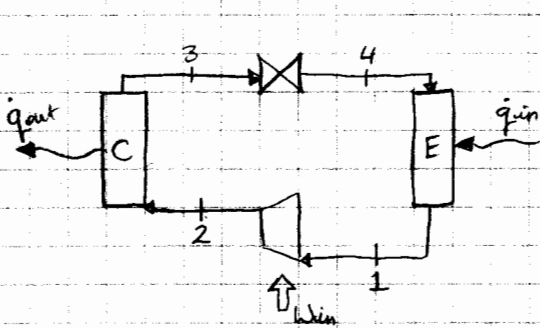


Q1

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State	T(°C)	P(kPa)	v (m ³ /kg)	h (kJ/kg)	s (kJ/kgK)	Condition
1		160		✓ 237.97	0.9295	sat vap
2		700		✓ 268.40	0.9295	super heated vap
3		700		✓ 86.78		sat liq
4		160		✓ 86.78		2 phase

$$\dot{q}_{in} = \left(\frac{12 \text{ kg}}{\text{hour}}\right) \left(\frac{\text{hour}}{3600 \text{ s}}\right) \left(\frac{384 \text{ kJ}}{1 \text{ kg}}\right) = 1.28 \text{ kJ/s} = 1.28 \text{ kW}$$



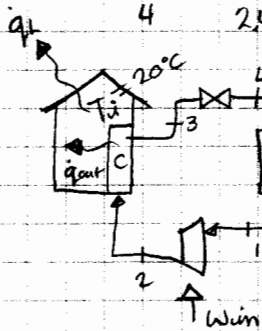
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$$\dot{q}_{in} = \dot{m}(h_2 - h_1) \therefore \dot{m} = \frac{\dot{q}_{in}}{(h_2 - h_1)} = \frac{1.28 \text{ kW}}{(268.40 - 237.97) \text{ kJ/kg}} = 0.008467 \text{ kg/s}$$

$$\dot{w}_{in} = \dot{m}(h_2 - h_1) = 0.008467 \text{ kg/s} (268.40 - 237.97) \text{ kJ/kg} = 0.25763 \text{ kW} = \boxed{257.63 \text{ W}}$$

Q2

State	T(°C)	P(kPa)	v (m ³ /kg)	h (kJ/kg)	s (kJ/kgK)	Condition
1		320		✓ 248.66	0.9177	sat vap
2	31.33	800		✓ 267.58	0.9177	super heated
3		800		✓ 93.42		sat liq
4	248	320		✓ 93.42		2 phase



$$T_c = 20^\circ\text{C} \quad T_o = 10^\circ\text{C} \quad \dot{q}_{out} = \dot{q}_{loss} = 75,000 \frac{\text{kJ}}{\text{hr}} = 20.833 \text{ kW}$$

$$\dot{q}_{out} = \dot{m}(h_2 - h_3) \therefore \dot{m} = \frac{\dot{q}_{out}}{h_2 - h_3} = \frac{20.833 \text{ kW}}{(267.58 - 93.42) \text{ kJ/kg}} = 119.62 \times 10^{-3}$$

a) $\dot{w}_{in} = \dot{m}(h_2 - h_1) = 0.122 \text{ kg/s} (267.58 - 248.66) \text{ kJ/kg} = \boxed{2.263 \text{ kW}}$

b) $\text{COP} = \frac{\dot{q}_{out}}{\dot{w}_{in}} = \frac{20.833 \text{ kW}}{2.263 \text{ kW}} = \boxed{9.20}$

See TS from Q1.

c) $\dot{q}_{total} = \dot{q}_{out} + \dot{w}_{in} = 20.833 - 2.263 = \boxed{18.57 \text{ kW}}$

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