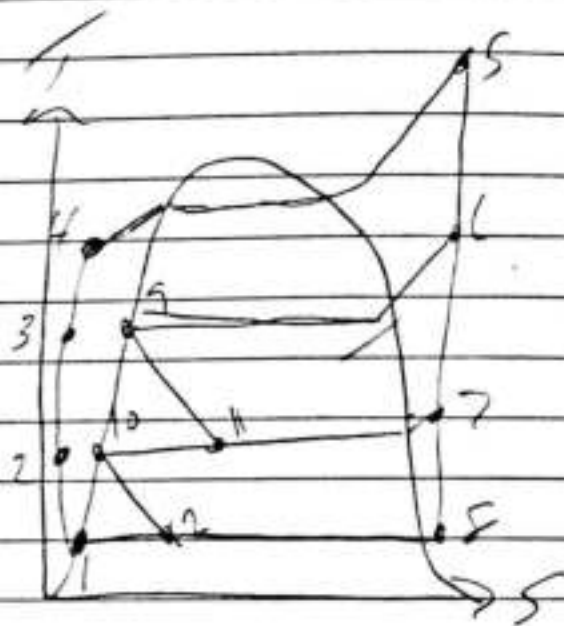
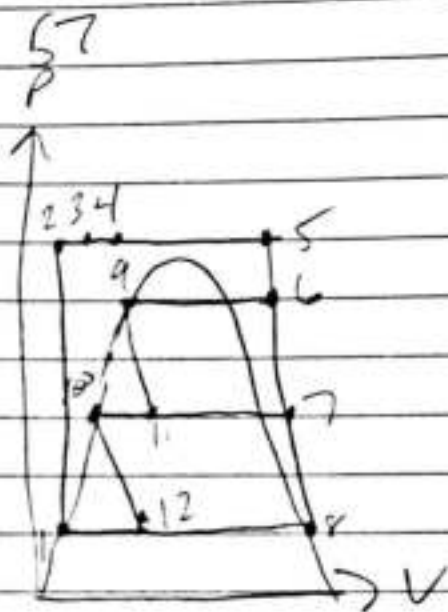


ROY SHEPPARD N.E.T 350 H/W 2.2

Questions 57, 69, 72



$$P_1 = 20 \text{ kPa}$$

$$h_1 = 251 \text{ kJ/kg}$$

$$v_1 = 0.00102 \text{ m}^3/\text{kg}$$

$$P_{11} = 245 \text{ kPa}$$

$$h_{11} = 533 \text{ kJ/kg}$$

$$P_2 = 5000 \text{ kPa}$$

$$h_2 = 256.1 \text{ kJ/kg}$$

$$P_{12} = 245 \text{ kPa}$$

$$h_{12} = 533 \text{ kJ/kg}$$

$$P_3 = 5000 \text{ kPa}$$

$$h_3 = 523 \text{ kJ/kg}$$

$$h_2 = h_1 + v_f(P_2 - P_1)$$

(b)

$$P_4 = 500 \text{ kPa}$$

$$h_4 = 830 \text{ kJ/kg}$$

$$z = \frac{h_3 - h_2 + v(h_{11} - h_{10})}{h_7 - h_{11}}$$

$$= 0.0981$$

$$P_5 = 5000 \text{ kPa}$$

$$h_5 = 3200 \text{ kJ/kg}$$

$$T_5 = 700^\circ\text{C}$$

$$m_w = m_s \left[\frac{(1 - y - z)h_5 + (y + z)h_{12} - h_1}{(p_w - p_s)T_s} \right]$$

$$P_6 = 1400 \text{ kPa}$$

$$h_6 = 3105 \text{ kJ/kg}$$

$$= 3.47 \text{ kJ/s} \quad (c)$$

$$w_T = h_5 - y h_6 - z h_7 - (1 - y - z) h_8 = 1245.5 \text{ kJ/kg}$$

$$P_7 = 245 \text{ kPa}$$

$$h_7 = 2518 \text{ kJ/kg}$$

$$w_{net} = 1245 - (0.00102(5000 - 20)) = 1240.3 \text{ kJ/kg}$$

$$P_8 = 20 \text{ kPa}$$

$$h_8 = 2477 \text{ kJ/kg}$$

$$w_{act} = m \cdot w_{net} = 93 \text{ mm}$$

$$P_9 = 1400 \text{ kPa}$$

$$h_9 = 830 \text{ kJ/kg}$$

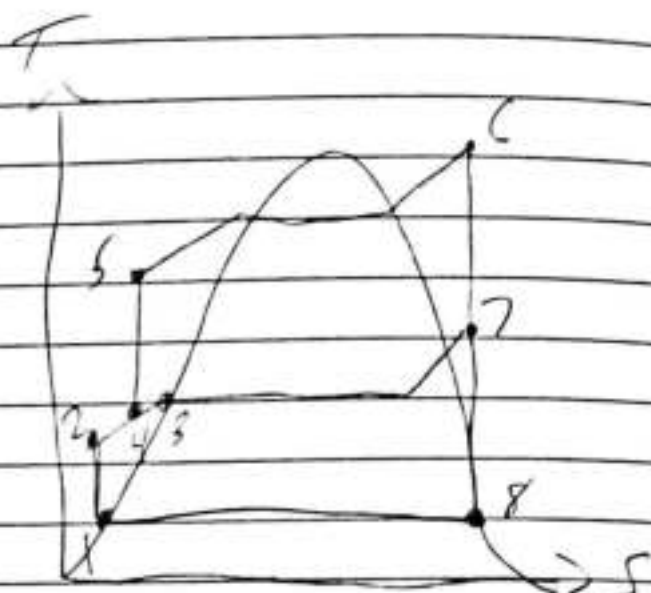
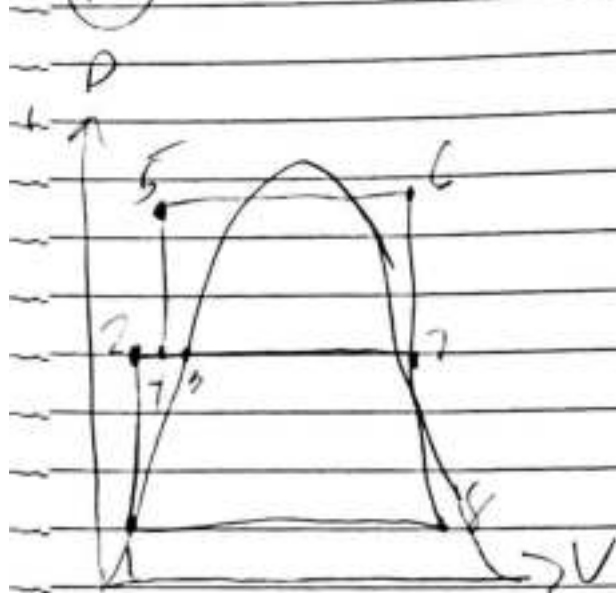
$$Q_{in} = m(h_5 - h_4) = 230 \text{ mm}$$

$$P_{10} = 1400 \text{ kPa}$$

$$h_{10} = 830 \text{ kJ/kg}$$

$$\eta = \frac{w_{act}}{Q_{in}} = 40.4\% \quad (d)$$

(6)



$$P_1 = 10 \text{ kPa}$$

$$W_{\text{comp}} = V_1 (P_2 - P_1) = 1502 \text{ kJ/kg}$$

$$h_1 = 191 \text{ kJ/kg}$$

$$V_1 = 0.01 \text{ m}^3/\text{kg}$$

$$W_P = h_1 - h_2$$

$$P_2 = 1200 \text{ kPa}$$

$$m_3 h_3 + m_2 h_2 = m_4 h_4$$

$$h_2 = 193.01 \text{ kJ/kg}$$

$$W_{\text{P}} = V_1 (P_5 - P_4) = 2.8 \text{ kJ/kg}$$

$$P_3 = 1200 \text{ kPa}$$

$$h_3 = 798.6 \text{ kJ/kg}$$

$$m_6 = 4 \text{ kg} - 2.5 \text{ kg} = 1.5 \text{ kg}$$

$$m_7 = 15.75 \text{ kg/s}$$

$$P_4 = 1200 \text{ kPa}$$

$$h_4 = 344.41 \text{ kJ/kg}$$

$$V_4 = 0.01 \text{ m}^3/\text{kg}$$

$$h_5 = h_4 + W_{\text{P}}$$

$$P_5 = 700 \text{ kPa}$$

$$W_{\text{Turb}} = m_7 (h_6 - h_7) + m_8 (h_6 - h_8) = 54.5 \text{ kJ/kg}$$

$$h_6 = 317.21 \text{ kJ/kg}$$

$$Q_{\text{in}} = m_5 (h_6 - h_5) = 170,400 \text{ kJ/kg}$$

$$h_7 = 317.21 \text{ kJ/kg}$$

$$Q_P = m_7 (h_7 - h_3) = 21,365 \text{ kJ/kg}$$

$$P_6 = 4 \text{ MPa}$$

$$P_7 = 1200 \text{ kPa}$$

$$P_8 = 10 \text{ kPa}$$

$$T_6 = 500 \text{ C}$$

$$h_7 = 327.97 \text{ kJ/kg}$$

$$h_8 = 226.7 \text{ kJ/kg}$$

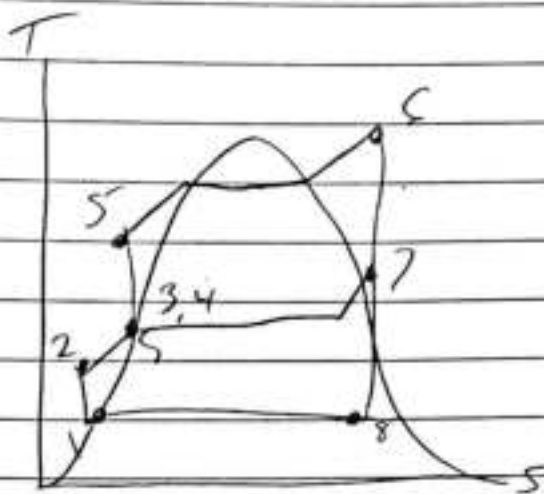
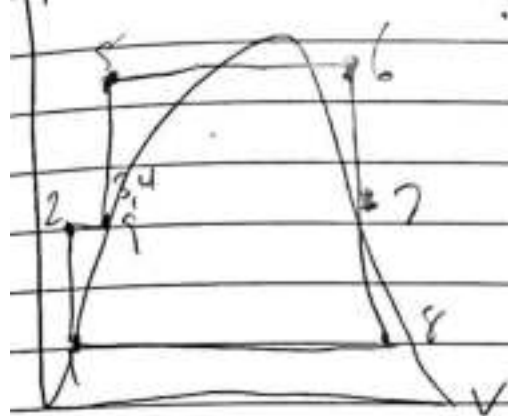
$$h_6 = 3445.4 \text{ kJ/kg}$$

$$S_6 = 7.11 \text{ kJ/kg} \cdot \text{K}$$

$$\Sigma U = W_{\text{net}} + Q_P$$

$$= 1502$$

72
p



$$P_1 = 10 \text{ kPa}$$

$$T_1 = 45.81^\circ\text{C}$$

$$h_1 = 191.81 \text{ kJ/kg}$$

$$v_1 = 100/0.01 \text{ m}^3/\text{kg}$$

$$P_2 = 1.6 \text{ MPa}$$

$$h_2 = 193.42 \text{ kJ/kg}$$

$$P_3 = 1.6 \text{ MPa}$$

$$h_3 = 857.91 \text{ kJ/kg}$$

$$P_4 = 1.6 \text{ MPa}$$

$$h_4 = 857.95 \text{ kJ/kg}$$

$$v_4 = 100/153 \text{ m}^3/\text{kg}$$

$$h_2 = h_1 + v_1(P_2 - P_1)$$

$$h_5 = h_4 + v_4(P_5 - P_4)$$

$$x_7 = \frac{s_7 - s_{c7}}{s_{f7}}$$

$$h_7 = h_{f7} + x_7 h_{fg7}$$

$$h_8 = h_{f8} + x_8 h_{fg8}$$

$$w_{\text{net}} = mT \left[(h_6 - h_7) + (1 - v_1)(h_2 - h_1) - (1 - v_4)(h_2 - h_1) - (h_5 - h_4) \right]$$

$$[mT = 29.063 \text{ kJ/s}]$$

$$P_5 = 9 \text{ MPa}$$

$$h_5 = 866.57 \text{ kJ/kg}$$

$$P_6 = 9 \text{ MPa}$$

$$T_6 = 400^\circ\text{C}$$

$$h_6 = 3181.8 \text{ kJ/kg}$$

$$s_6 = 6.25 \text{ kJ/kg}\cdot\text{K}$$

$$P_7 = 1.6 \text{ MPa}$$

$$h_7 = 2729.44 \text{ kJ/kg}$$

$$P_8 = 1.5 \text{ MPa}$$

$$h_8 = 857.91$$

$$T_8 = 201.8^\circ\text{C}$$

$$P_8 = 10 \text{ kPa}$$

$$s_8 = 6.25 \text{ kJ/kg}\cdot\text{K}$$

$$h_8 = 1940.35 \text{ kJ/kg}$$