

HW Chp 9: 88, 99, 107, 119, 121

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119

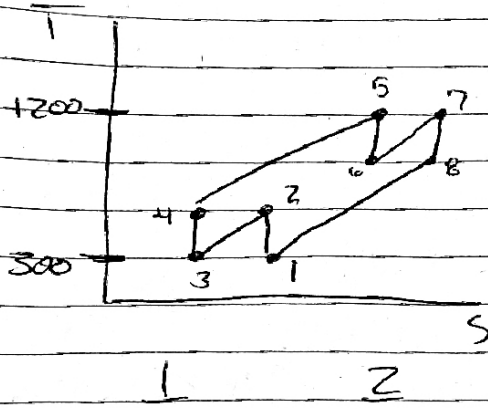


Table A-17

$$P_2 = \frac{P_2}{P_1} P_1 = 3(1.386) = 4.158$$

$$h_2 = 411.26 \text{ kJ/kg}$$

Table A-17

$$1200^\circ\text{K} = T_5$$

$$1277.79 \text{ kJ/kg} = P_5$$

$$P_6 = \frac{P_6}{P_5} (P_5) = \frac{1}{3}(238) = 79.33$$

Table A-17

$$h_6 = 946.36 \text{ kJ/kg}$$

$$W_{\text{in}} = 2(h_2 - h_1)$$

$$2(411.26 - 300.19)$$

$$= 222.14 \text{ kJ/kg}$$

$$W_{\text{out}} = 2(h_5 - h_6)$$

$$2(1277.79 - 946.36)$$

$$= 662.86 \text{ kJ/kg}$$

$$W_{\text{net}} = W_{\text{out}} - W_{\text{in}}$$

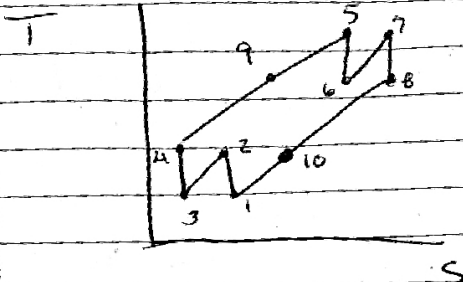
$$m = \frac{W_{\text{net}}}{W_{\text{net}}} = \frac{119,000}{490.17}$$

$$662 - 222$$

$$= 440.17 \text{ kJ/kg}$$

$$= 249.6 \text{ kg/s}$$

121



1 A-17 $T_1 = 300^{\circ}\text{K}$
 $h_1 = 300.19 \text{ kJ/kg}$
 $P_{r1} = 1.386$

(7) $w_{\text{in}} = 2(h_2 - h_1)$
 $2(411.26 - 300.19)$
 $= 222.14 \text{ kJ/kg}$

2 $P_{r2} = \frac{P_2}{P_1}(P_{r1}) = \frac{3(1.386)}{1} = 4.158$

(8) $w_{\text{out}} = 2(h_5 - h_4)$
 $2(1277.79 - 946.35)$
 662.8 kJ/kg

3 $h_2 = \text{Interpolate}$
 411.26 kJ/kg

(9) $h_2 = h_u$
 $\eta_{\text{br}} = \frac{w_{\text{c}}}{w_{\text{T}}} = 33.50\%$

4 A-17

$T_5 = 1200^{\circ}\text{K}$

$P_{r5} = 238$

$h_5 = 1277.79 \text{ kJ/kg}$

(10) $q_{\text{in}} = (h_5 - h_4) + (h_1 - h_c)$
 1197.97 kJ/kg

(11) $w_{\text{net}} = w_{\text{out}} - w_{\text{in}}$
 440.74 kJ/kg

5 $P_{r6} = 1/3(238)$
 79.53

(12) $\eta_{\text{th}} = \frac{w_{\text{net}}}{q_{\text{in}}} = 36.8\%$

6 Interpolate $h_6 = h_8$

(13) $q_{\text{regen}} = \epsilon(h_8 - h_4)$
 $0.25(946.35 - 411.26)$
 $= 401.32$

$= 946.35 \text{ kJ/kg}$

(14) $q_{\text{in}} = (q_{\text{in}(1)} - q_{\text{regen}})$

(15) $\eta_{\text{th}} = \frac{w_{\text{net}}}{q_{\text{in}}} = 55.39\%$

$= 1166.165 \text{ kJ/kg}$