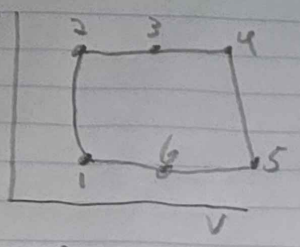
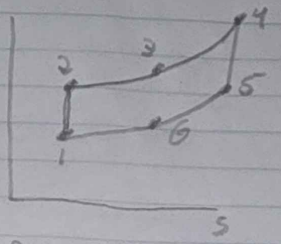
(117)





$P_1 = 100\,kPa$ $T_1 = 310\,K$ $h_1 = 310.24$ $P_{r_1} = 1.555$

$P_{r_2} = P_r \cdot P_{r_1} = 7 \cdot 1.555 = 10.885$ $h_{2s} = 541.3$ $\eta_c = \frac{h_{2s} - h_1}{h_2 - h_1}$

$h_2 = 310.24 + (541.3 - 310.24)/1.75 = 618.3$ $\eta_c = \frac{h_2 - h_1}{h_{2s} - h_1}$ $h_2 = 618.3 + .65(903 - 618)$

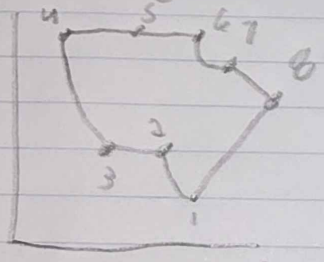
$h_3 = 738.4$ $P_{r_5} = \frac{1}{P_r} \cdot P_{r_4} = \frac{1}{7} \cdot 200 = 28.6$ $h_{5s} = 712$ $\eta_T = \frac{h_4 - h_5}{h_4 - h_{5s}}$

$h_5 = 1219 - .92(1219 - 712) = 804.3$ $T_5 = 783\,K$

$w_{out} = 1219 - 804.3 = 416$ $w_{in} = 618.3 - 310 = 308$ $w_{net} = 416 - 308 = 108$

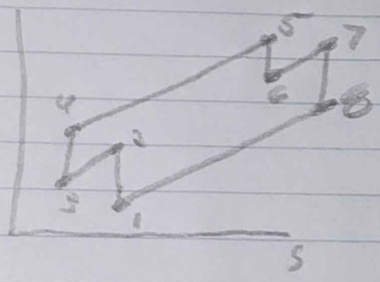
$P_{in} = h_4 - h_3 = 1219 - 738.4 = 480.6$ $\eta_{th} = \frac{108}{480.6} = .225$ or 22.5%

(119)



$P_r = \sqrt{9} = 3$

$P_{r_1} = 9$



$P_{r_2} = (P_r) P_{r_1} = 3(1.386) = 4.158$ $h_2 = 411.3$ $T_2 = T_{411} = 410\,K$

$P_{r_6} = \frac{1}{P_r} P_{r_5} = \frac{1}{3}(238) = 79.3$ $h_6 = 946.4$ $T_6 = T_{946} = 910\,K$

$w_{in} = 2(h_2 - h_1) = 2(411 - 310) = 202$ $w_{out} = 2(h_8 - h_{6a}) = 2(1278 - 946) = 664$

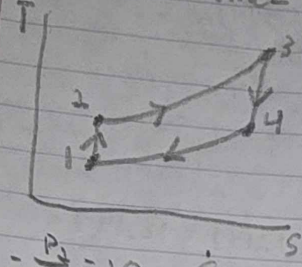
$w_{net} = w_{out} - w_{in} = 664 - 202 = 462$ $\dot{m} = \frac{\dot{W}_{net}}{w_{net}} = \frac{120\,kW}{462\,kJ/kg} = 260$

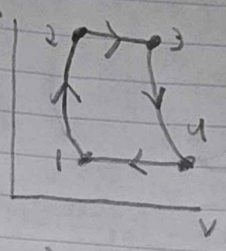
(121) $R_{BW} = \frac{w_{in}}{w_{out}} = \frac{202}{664} = 30.5\%$ $P_{in} = h_5 - h_4 + h_7 - h_6 = 1278 - 411 + 1278 - 946 = 1849$

$\eta_{th} = \frac{w_{net}}{P_{in}} = \frac{462}{1198} = 37\%$ $P_f = 2(h_8 - h_{6a}) = .75(946.4 - 411) = 401.4$

$P_{in_2} = 1198 - 401.4 = 796.6$ $\eta_{th} = \frac{462}{796.6} \cdot 100 = 58.4\%$

88) Daniel Martinez MET 350 HW 1.4





$r_p = \frac{P_2}{P_1} = 10$ $\dot{Q}_{in} = 500$ $\dot{m} = 1\ kg/s$ $P_1 = 70\ kPa$ $T_1 = 0C + 273 = 273K$

$s_2 = s_1$ $\frac{T_2}{T_1} = \frac{P_2}{P_1}^{(k-1/k)}$ $T_2 = 273(10)^{.4/1.4} = 527.1$

$\dot{Q}_{in} - \dot{W}_{in} = \dot{m}(h_2 - h_1) = \dot{m} C_p (T_2 - T_1)$ $\dot{W}_{in} = (1.005)(273 - 527.1) = -255.3$

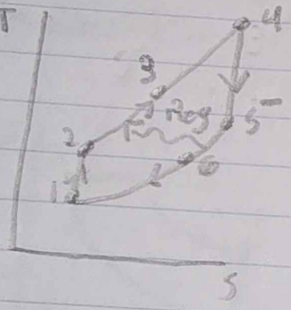
$\dot{Q}_{in} - \dot{W}_{out} = \dot{m}(h_3 - h_2) = \dot{m} C_p (T_3 - T_2)$ $T_3 = T_2 + \frac{\dot{Q}}{\dot{m} C_p} = 527.1 + \frac{500}{(1)(1.005)} = 1025K$

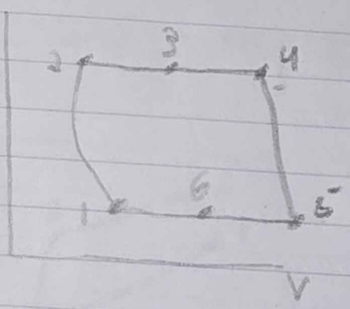
$\dot{Q}_{out} - \dot{W}_{out} = \dot{m}(h_4 - h_3) = \dot{m} C_p (T_4 - T_3)$ $T_4 = 1025\left(\frac{1}{10}\right)^{.4/1.4} = 530.7\ K$

$\dot{W}_4 = 1(1.005)(1025 - 530.7) = 496.8$ $\dot{W}_{net} = -255.3 + 496.8 = 241.5$

$\eta_{th} = \frac{\dot{W}_{net}}{\dot{Q}_{in}} = \frac{241.5}{500} = .483$ or 48.3%

99)





$P_1 = 100\ kPa$ $T_1 = 303K$ $\frac{T_2}{T_1} = \frac{P_2}{P_1}^{\frac{k-1}{k}}$ $T_2 = 303(10)^{.4/1.4} = 585K$

$P_2 = 1000$ $T_2 = 595\ kPa$ $T_3 = 536 - 10 = 546K$ $P_3 = 1000\ kPa$

$P_4 = 1000\ kPa$ $T_4 = 1073K$ $T_5 = 1073\left(\frac{1}{10}\right)^{.4/1.4}$ $T_5 = 555.76$ $P_5 = 100\ kPa$

$P_6 = 100\ kPa$ $T_6 = 595K$ $T_6 = 556 - (546 - 585) = 595K$

$w_2 = C_p(T_2 - T_1) = 1(585 - 303) = 282$ $w_4 = C_p(T_4 - T_5) = 1(1073 - 566) = 517$

$w_{net} = 517 - 282 = 235$ $\dot{m} = \frac{w_{net\ given}}{w_{net\ calc}} = \frac{115}{235} = .489$

$\dot{Q}_{in} = \dot{m} C_p (T_4 - T_2) = .489(1073 - 546) = 258\ KW$

$\dot{Q}_{out} = .489(595 - 303) = 143\ KW$