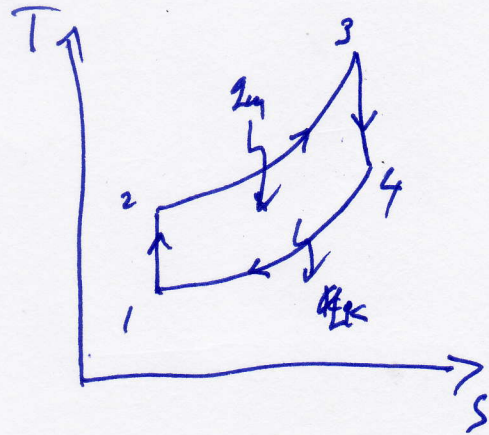
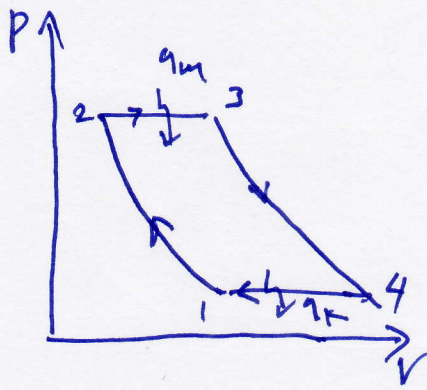


5.7



Dik :  
 $r_p = 4,2$   
 $P_1 = 100 \text{ kPa}$   
 $T_1 = 25^\circ\text{C} = 298 \text{ K}$   
 $q_m = 450 \text{ kJ/kg}$

diminta:

- $T, P, V$  setiap keadaan
- $q_k, w_c, w_T, w_{net}$
- $\eta_{th}$

Solusi:

(a) titik 1 .  
 $T_1 = 298 \text{ K}$   
 $P_1 = 100 \text{ kPa}$   
 $v_1 = \frac{RT_1}{P_1} = 0,8553 \text{ m}^3/\text{kg}$

Titik 2 . (1-2) isentropik  $\rightarrow \frac{T_2}{T_1} = r_p^{\left(\frac{\gamma-1}{\gamma}\right)}$   
 $P_2 = r_p P_1 = 4,2 \cdot 100 = 420 \text{ kPa}$   
 $T_2 = T_1 r_p^{\left(\frac{\gamma-1}{\gamma}\right)} = 298 \cdot (4,2)^{0,286} = 449,23 \text{ K}$   
 $v_2 = \frac{RT_2}{P_2} = \frac{0,287 \cdot 449,23}{420} = 0,307 \text{ m}^3/\text{kg}$

Titik 3 .

$$P_3 = P_2 = 420 \text{ kPa}$$

$$T_3 = \frac{q_m}{C_p} + T_2 = \frac{450}{1,0035} + 449,23$$

$$= 897,7 \text{ K}$$

$$v_3 = \frac{RT_3}{P_3} = 0,613 \text{ m}^3/\text{kg}$$

Titik 4. (3-4 isentropik)

$$P_4 = P_1 = 100 \text{ kPa}$$

$$T_4 = \frac{T_3}{r_p^{\frac{\gamma-1}{\gamma}}} = \frac{897,7}{(4,2)^{0,286}} = 595,5 \text{ K}$$

$$v_4 = \frac{RT_4}{P_4} = 1,709 \text{ m}^3/\text{kg}$$

$$(b) \quad q_{in} = C_p(T_4 - T_1) = 1,0035(596 - 290) = 299,04 \text{ kJ/kg}$$

$$w_c = C_p(T_2 - T_1) = 1,0035(449,23 - 290) = 151,23 \text{ kJ/kg}$$

$$w_T = C_p(T_3 - T_4) = 1,0035(898 - 596) = 302,257 \text{ kJ/kg}$$

$$w_{net} = w_T - w_c = 302,257 - 151,23 = 151,027 \text{ kJ/kg}$$

150,97 kJ/kg

$$(c) \quad \eta_{th} = \frac{w_{net}}{q_{in}}$$
$$= \frac{150,97}{450} = 0,3355$$
$$\approx 33,6 \%$$