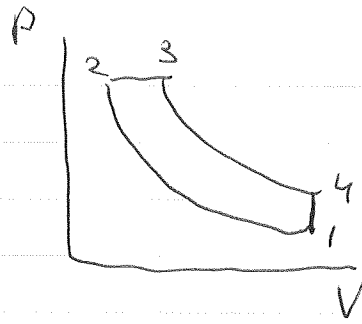


g.B. air standard diesel



$$P_2 = P_3 \quad ||$$

$$T_1 = 300 \text{ K}$$

$$P_1 = 95 \cdot 10^3 \text{ Pa}$$

$$P_3 = 7.2 \cdot 10^6 \text{ Pa}$$

$$T_3 = 2150$$

a) $\frac{V_1}{V_2} = ?$

$$\frac{V_1}{V_2} = \frac{V_{r1}}{V_{r2}} =$$

$$\frac{P_1}{P_2} = \frac{P_{r1}}{P_{r2}}$$

$$P_{r2} = P_{r1} \cdot \left(\frac{7200}{95} \right)^{1.3860} \quad (T A:)$$



T-A22

$$T_2 (P_2 = 105) = 980 \text{ K}$$

$$V_{r2} = 26.7$$

$$\frac{V_1}{V_2} = \frac{621}{26.7} = 23.2$$

b) $\frac{V_2}{T_2} = \frac{V_3}{T_3} \quad \frac{V_3}{V_2} = \frac{2150}{980} = 2.2$

c) $\eta = \frac{W}{Q_{in}} = \frac{Q_{23} - Q_{41}}{Q_{23}} = \frac{(h_3 - h_2) - (u_4 - u_1)}{(h_3 - h_2)}$

$$h_3 = 2440 \text{ kJ/kgk}$$

$$h_2 = 1023 \text{ kJ/kgk}$$

$$u_1 = 412 \text{ kJ/kgk}$$

$$u_4 = ?$$

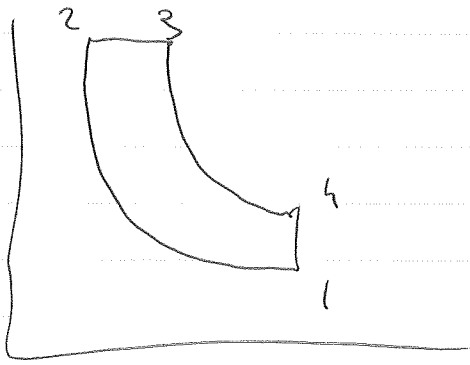
$$\left(\frac{V_4}{V_3} = \frac{V_1}{V_3} = \frac{V_1}{V_2} \cdot \frac{V_2}{V_3} = \frac{23.2}{2.2} = 10.5 \right)$$

$$\frac{V_4}{V_3} = \frac{V_{r4}}{V_{r3}} = \quad V_{r4} = 10.5 \cdot 21.75 = 22.8 \quad T_4 = 1030 \text{ K}$$

$$u_4 = 785 \text{ kJ/kgk}$$

$\eta \approx 0.597$

g.14 cold air standard



$$P_1 = 95 \cdot 10^3 \text{ Pa}$$

$$T_1 = 300 \text{ K}$$

$$P_3 = 7.2 \cdot 10^1 \text{ Pa}$$

$$1 \rightarrow 2 \quad PV^k = C \quad V = \frac{mRT}{P}$$

$$P^{1-k} T^k = \text{const}$$

$$P_1^{1-k} T_1^k = P_2^{1-k} T_2^k$$

$$\left(\frac{P_1}{P_2}\right)^{1-k} = \left(\frac{T_2}{T_1}\right)^k$$

$$k = 1.4$$

$$T_2 = T_1 \left(\frac{P_1}{P_2}\right)^{\frac{1-k}{k}}$$

$$= 300 \cdot 3.43 = 1030 \text{ K}$$

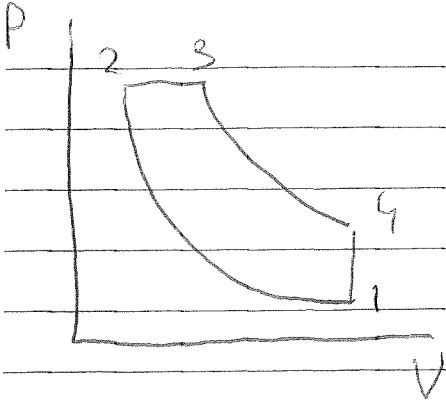
$$a) \frac{V_1}{V_2} = \frac{T_1/P_1}{T_2/P_2} = \frac{300 / 95 \cdot 10^3}{1030 / 720 \cdot 10^0} = 22.1$$

$$b) \frac{V_3}{V_2} = \frac{T_3}{T_2} = \frac{2150}{1030} = 2.1$$

$$c) \eta = 1 - \frac{1}{r_c^{k-1}} \left[\frac{r_c^k - 1}{k(r_c - 1)} \right] = 1 - \frac{1}{22.1^{0.4}} \left[\frac{2.1^{1.4} - 1}{1.4(2.1 - 1)} \right]$$

$$= 0.656 \quad 65\%$$

g.15)



$$P_1 = 200 \text{ kPa}$$

$$T_1 = 300 \text{ K}$$

$$V_1 = 20$$

$$\frac{V_1}{V_2}$$

$$\frac{Q_{23}}{m} = 900 \text{ kJ/kg}$$

$$\frac{V_1}{V_2} = \frac{V_{R1}}{V_{R2}} = 20 = \frac{V_{R1}}{V_{R2}} \Rightarrow 20 = \frac{343.4}{V_{R2}} \quad V_{R2} = 17.17$$

$$T_2 (V_2 = 17.17) = 1135 \text{ K}$$

$$h_2 = 1202 \text{ kJ/kg}$$

$$\frac{Q_{23}}{m} = m(h_3 - h_2) \quad h_3 = 2102 \text{ kJ/kg}$$

$$T_3 = 1880 \text{ K}$$

$$r_c = \frac{V_3}{V_2} = \frac{T_3}{T_2} = \frac{1880}{1135} = 1.66$$

c) $Q_{41} = ? \quad T_4 = ? \quad \frac{V_4}{V_3} = \frac{V_{R4}}{V_{R3}}$

$$\frac{V_4}{V_3} = \frac{V_1}{V_3} = \frac{V_1}{V_2} \cdot \frac{V_2}{V_3} \Rightarrow \frac{20}{1.66} = \frac{V_{R4}}{34202} \quad V_{R4} = 41.3$$

$$T_4 = 820 \text{ K}$$

$$u_4 = 628 \text{ kJ/kg}$$

$$u_1 = 271.7 \text{ kJ/kg}$$

$$\frac{Q_{41}}{m} = 628 - 271.7 = 356.3 \text{ kJ/kg}$$

$$\frac{W}{m} = Q_{23} - Q_{41} = 900 - 356.3 = 544 \text{ kJ/kg}$$

$$\eta = \frac{W}{Q_{23}} = \frac{544}{900} = 0.60$$

$$MEP = 1049 \text{ kPa}$$