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7a) $0 = \dot{m} \cdot (h_e - h_a) - \dot{Q}_{aus}$

$\dot{Q}_{aus} = \dot{m} \cdot (h_e - h_a) = \underline{\underline{-37,575\ kW}}$

$\dot{m} = 0,3 \frac{kg}{s}$

$h_e \overset{A-2}{=} h_f[70°] = 292,98 \frac{kJ}{kg}$

$h_a \overset{A-2}{=} h_f[100°] = 419,04 \frac{kJ}{kg}$

b)

c) $0 = \dot{S}_{e,2} + \frac{\dot{Q}_{aus}}{T_{KF}} - \frac{\dot{Q}_{aus}}{T_{Reaktor}}$

$\dot{S}_{e,2} = \dot{Q}_{aus} \left(\frac{1}{T_{Reaktor}} - \frac{1}{T_{KF}} \right) = \underline{\underline{-46,1463 \frac{J}{K}}}$

$\dot{Q}_{aus} = 65kW$

$T_{KF} = 295K$

$T_{Reaktor} = 373,15K$

d) $\Delta E = m_2 \cdot u_2 - m_1 \cdot u_1 = \Delta m_i [h_i] - Q_{E12}$

$m_2 = m_1 + \Delta m$

$u_2 \overset{A-2}{=} u_f[100°]$

$u_1 = u_F[100°] + x_D \cdot [u_g - u_f][100°]$

$h_i \overset{A-2}{=} h_f[20°]$

$\dot{Q}_{E12} = 30M)$

$\Delta m = \frac{m_1 \cdot u_2 - m_1 u_1 + Q_{E12}}{h_i - u_2} = 3636,8843076kg$

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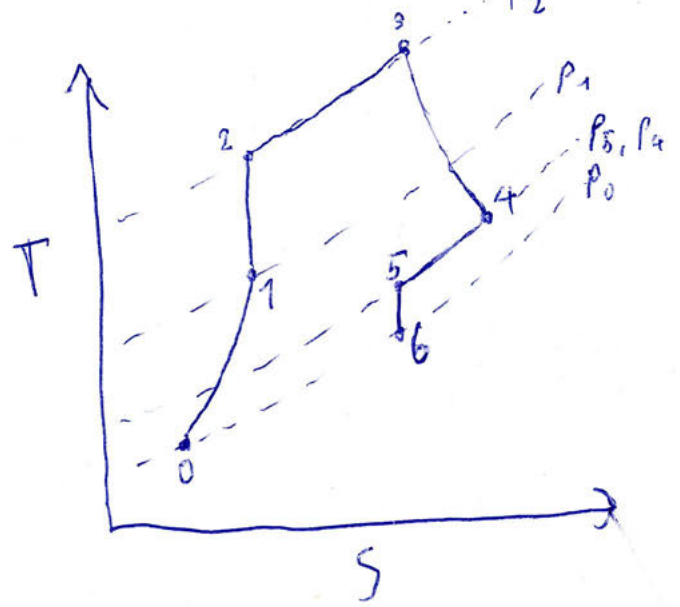
2a)



b) w_a

$$0 = \dot{m}\left[h_e - h_a + \frac{w_e^2 - w_a^2}{2}\right] - \dot{W}_{t,rev}$$

$$h_e - h_a = c_p^{'g}\left(T_5 - T_6\right) = 104{,}448\ \frac{kJ}{kg}$$

$$T_6 = \left(\frac{p_6}{p_5}\right)^{\frac{k-1}{k}} \cdot T_5 = 328.0746969\ K$$

$k = 1.4$

$$\dot{W}_t = w_{a,rev} = \dot{m}\,\frac{R(T_6 - T_5)}{1-n} = 74{,}608\ \frac{kJ}{kg}$$

$$R = c_p - c_v = 0{,}2874255\overline{17}$$

$$c_v = \frac{c_p}{k} = 0{,}718\overline{9}\ \frac{kJ}{kgK}$$

$$0 = h_e - h_a + \frac{w_e^2}{2} - \frac{w_a^2}{2} - w_{rev}$$

$$w_a = \sqrt{\left(h_e - h_a + \frac{w_e}{2} - w_{rev}\right)\cdot 2} = 220{,}13559\ \frac{m}{s}$$

c)

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3a) $p_1 = 1\,bar + \frac{32\,kg \cdot g}{100cm \cdot \pi (0{,}5cm)^2}$

$= 1\,bar + 0{,}399695\,bar = 1{,}399695\,Bar$

$m = \frac{p \cdot V}{R T_1} = 0{,}003419\,kg$

$R = \frac{\bar{R}}{M_{Luft}} = 0{,}26628\,\frac{kJ}{kg}$

b) $u_{g1} - u_{g2} = u_{EW2} - u_{EW1}$

T_g und T_{EW} gleichen sich aus

das heisst $T_g = 0°C$, da sich die Temperatur im Nassdampfgebiet kaum ändert

c) $\Delta E = m(u_{2g} - u_{1g}) = |Q|$

$m \cdot (u_{1g} - u_{2g}) = c_v (T_2 - T_1) \cdot m = 1{,}1394\,kW = |Q|$

$c_v = 0{,}633\,\frac{kJ}{kgK}$

$m = 3{,}6\,g$

$T_{g2} = 0{,}003°C$

d)

a) $\Delta E_{EW} = \Delta U_{EW} = {}^1Q_{12}$

$$U_{2EW} - U_{1EW} = {}^1Q_{12} = \frac{1500\,J}{Mer} = \frac{15\,kJ}{kg}$$

$$U_1 = \left(0{,}6 \cdot u_{Fest}[0°] + 0{,}4 \cdot u_{Flüssig}[0°]\right) \cdot m_{EW} = -200{,}0928\ \frac{kJ}{kg}$$

$$u_2 = \left(x_2 \cdot u_{Fest}[0{,}003°] + [1-x_2] \cdot u_{Flüssig}[0{,}003°]\right) \cdot m_{EW}$$

$u_{Fest}[0°] = -333{,}458\ \frac{kJ}{kg}$

$u_{Flüssig}[0°] = -0{,}045\ \frac{kJ}{kg}$

$u_{Fest}[0{,}003°] = -333{,}442\ \frac{kJ}{kg}$

$u_{Flüssig}[0{,}003°] = -0{,}033\ \frac{kJ}{kg}$

$$-x_2 \cdot 333{,}442\ \frac{kJ}{kg} - (1-x_2) \cdot 0{,}033\ \frac{kJ}{kg} = 15\ \frac{kJ}{kg} - 200{,}0928\ \frac{kJ}{kg} = -185{,}0928\ \frac{kJ}{kg}$$

$$x_2 = \frac{185{,}0928\ \frac{kJ}{kg} - 0{,}033\ \frac{kJ}{kg}}{333{,}44\ \frac{kJ}{kg} - 0{,}033\ \frac{kJ}{kg}} = 0{,}555$$

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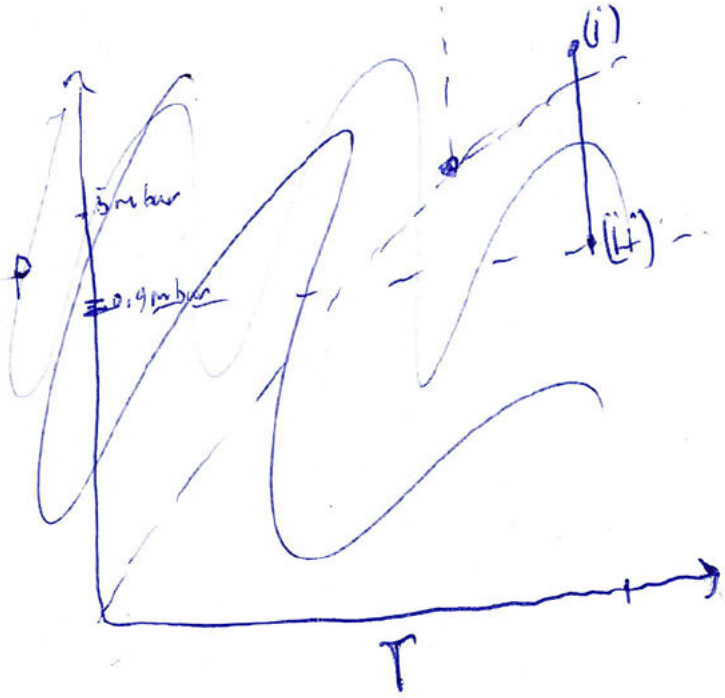
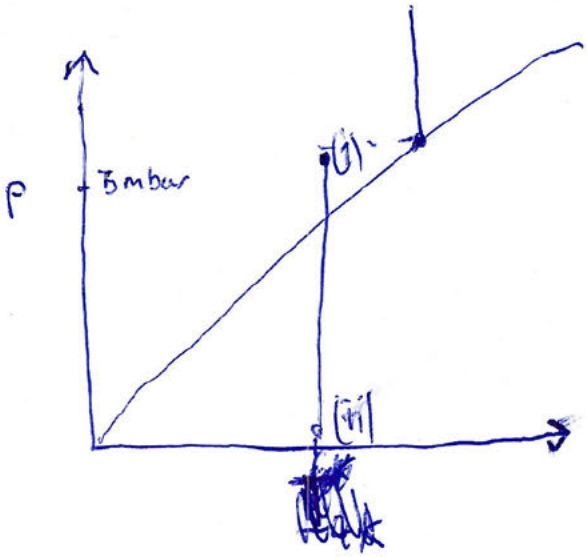
[redacted]

4a)





b) $-\dot{W}_K = \dot{m}\,[h_2 - h_3]$

$h_2 \overset{A-11}{=} h_g[2\,bar] = 241.3\ \frac{kJ}{kg}$

$h_3 \overset{A-11}{=} h_g[8\,bar] = 264,15\ \frac{kJ}{kg}$

$\dot{m} = \frac{-\dot{W}_K}{241.3\ \frac{kJ}{kg} - 264,15\ \frac{kJ}{kg}} = 1,22578\ \frac{kg}{s}$

c) $h_4 = h_1 = h_f[8\,bar] = 93{,}42$

$$x = \frac{h_1 - h_{1f}}{h_{1g} - h_{1f}}$$