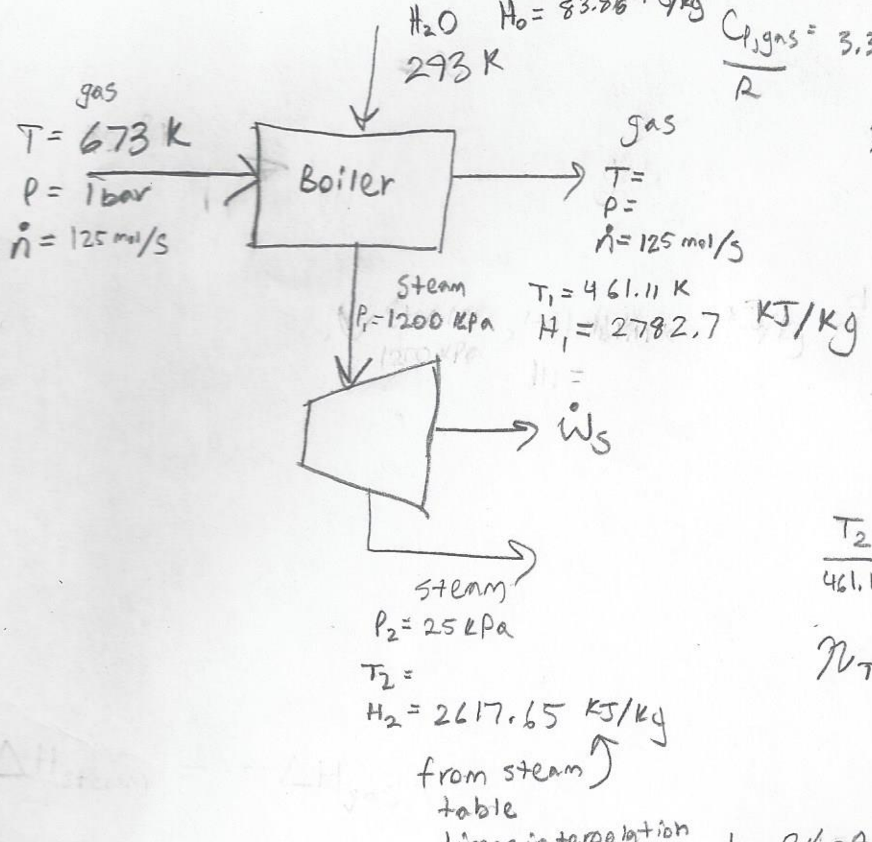
(2)



$$\frac{C_{p,gas}}{R} = 3.34 + 1.12\times10^{-3}\frac{T}{K}$$

$$\eta_T = 0.72$$

Assume complete separation of gas and steam

Assume steam leaving turbine is saturated vapor

$$\frac{T_2}{461.11} = \left(\frac{25}{1200}\right)^{R/C_p}$$

$$\eta_T = \frac{\dot{W}_s}{\dot{W}_{s,isentropic}}$$

$$d = 2604.9 + \frac{25-20}{30-20}(2625.4-2609.9)$$
$$= 2617.65 \text{ KJ/kg}$$

a) $\hat{W}_{s,isentropic} = \Delta\hat{H}_{steam}$ $\quad \dot{W}_s = ?$

$$\hat{W}_{s,isentropic} = (2617.65 \text{ KJ/kg} - 2782.7 \text{ KJ/kg})$$
$$= -165.05 \text{ KJ/kg}$$

$$\dot{W}_s = \dot{m}\hat{W}_s$$

$$0.72 = \frac{W_s}{-165.05} \qquad \hat{W}_s = (-165.05 \text{ KJ/kg})(0.72)$$
$$\hat{W}_s = -118.84 \text{ KJ/kg}$$

$$\dot{m}_{H_2O}\Delta\hat{H}_{H_2O} = \dot{n}_{gas}\Delta\tilde{H}_{gas} \qquad \Delta\tilde{H}_{gas} = R\int_{673}^{T_2}(3.34 + 1.12\times10^{-3}T)\,dT$$

$$= 8.314\left[3.34T + \frac{1.12\times10^{-3}}{2}T^2\right]_{673}^{T_2}$$

$$\Delta H_{gas} = 125\left\{27.77(T_2-673) + 4.656\times10^{-3}\left[T_2^2-673^2\right]\right\}$$

$$\dot{m}_{H_2O}(2782.7-83.86) = 3471.1(T_2-673) + 0.582\left[T_2^2-673^2\right]$$

[J]