Formula Sheet – Power Plants – Mid Term – Fall 2021

Specific heat of air 1.004 kJ/kgK, (k = 1.4)

$$\frac{y - y_0}{y_1 - y_0} = \frac{x - x_0}{x_1 - x_0}.$$

$$s_1 = s_{f\,@\,10\text{ kPa}} + x_1 s_{fg\,@\,10\text{ kPa}}$$

$$P_T = IV$$

$$P_L = I^2 R$$

$$\eta_{Carnot} = 1 - \frac{T_L}{T_H}$$

$$\frac{dE_{CV}}{dt} = \dot{Q}_{CV} - \dot{W}_{CV} + \dot{m}_i\left(h_i + \frac{1}{2}V_i^2 + g\,z_i\right) - \dot{m}_e\left(h_e + \frac{1}{2}V_e^2 + g\,z_e\right)$$

$$\frac{\dot{m}_2}{\dot{m}_3} + \frac{\dot{m}_6}{\dot{m}_3} = 1 \qquad \frac{\dot{m}_6}{\dot{m}_3} = \frac{\dot{m}_{ext}}{\dot{m}_t} = \lambda \qquad \lambda = \frac{h_3 - h_2}{h_6 - h_2}$$

$$(1-\lambda)h_2 + \lambda h_6 = h_3 \qquad \dot{m}(h_2 - h_1) = \dot{m}C_p(T_2 - T_1)$$

$$\eta_{Turb} = \frac{h_3 - h_4}{h_3 - h_{4s}}$$

$$s_2 - s_1 = C_v \ln\frac{T_2}{T_1} + R\ln\frac{v_2}{v_1} = C_p \ln\frac{T_2}{T_1} - R\ln\frac{p_2}{p_1}$$

$$w = v\,(P_2 - P_1)$$

$$w = P\,(v_2 - v_1)$$

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

$$\frac{p_2}{p_1} = \frac{p_{r2}}{p_{r1}}$$

$$\frac{T_3}{T_4} = \left(\frac{P_3}{P_4}\right)^{\frac{k-1}{k}}$$

$$\frac{p_3}{p_4} = \frac{p_{r3}}{p_{r4}}$$

$$\eta_{\text{Reg}} = \frac{h_{x'} - h_2}{h_4 - h_2}$$