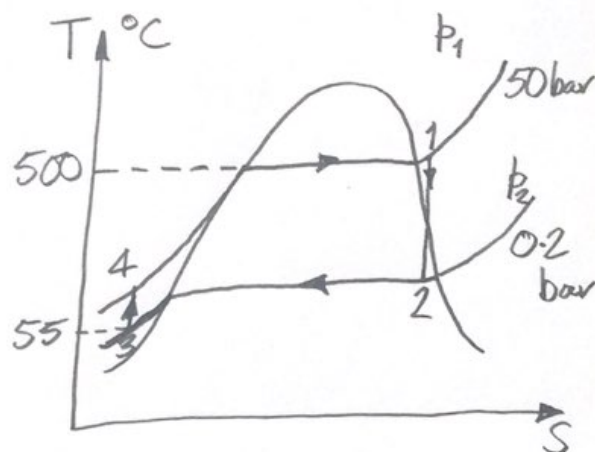
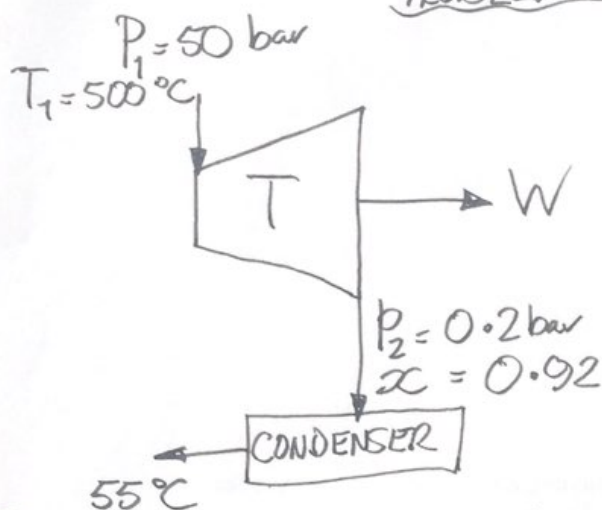


①

LECTURE 4

LG PLANT & ASSET ENG. ~ Steam Power Plant.PROBLEM

(a). Find power developed for $\dot{m}_{\text{steam}} = 1.5 \text{ kg/s}$;

Now, $W = \dot{m}(h_1 - h_2)$

where, h_1 is enthalpy of superheated steam at 50 bar pressure and temp. 500°C , so from steam tables;

$$h_1(50 \text{ bar}; 500^\circ\text{C}) = h_g = 3433 \text{ kJ/kg.}$$

and, h_2 is exit enthalpy at 0.2 bar and dryness fraction, $x = 0.92$.

$$\text{So, } h_2 = h_f + x \cdot h_{fg}$$

where, h_f at 0.2 bar = 251 kJ/kg } Saturated
and, h_{fg} at 0.2 bar = 2358 kJ/kg } Water & Steam.

$$\therefore h_2 = 251 + 0.92(2358) = 2420.36 \text{ kJ/kg}$$

Hence, $W = 1.5(3433 - 2420.36)$

$$\underline{W = 1518.96 \text{ kW.}}$$

②

L6 PLANT & ASSET ENG ~ Steam Power Plant

LECTURE 4

PROBLEM.

(b) Find heat energy lost to condenser cooling water;

$$\dot{Q}_{\text{cond.}} = \dot{m}_1 (h_2 - h_3)$$

Where, h_3 at 0.2 bar (i.e. h_f) = 230.2 kJ/kg

$$\therefore \dot{Q}_{\text{COND.}} = 1.5 (2420.36 - 230.2)$$

$$= \underline{\underline{3285.24 \text{ kW.}}}$$

(c). Find thermal (i.e. Rankine) efficiency of the steam plant;

$$\eta_R = \frac{h_1 - h_2}{h_1 - h_4}$$

but, feedpump work is neglected, so $h_3 = h_4$

$$\therefore \eta_R = \frac{h_1 - h_2}{h_1 - h_3} = \frac{3433 - 2420.36}{3433 - 230.2}$$

$$\text{So } \eta_R (\text{thermal efficiency}) = \underline{\underline{0.3162}}$$

$$\text{OR } \underline{\underline{31.62\% \text{ efficient.}}}$$