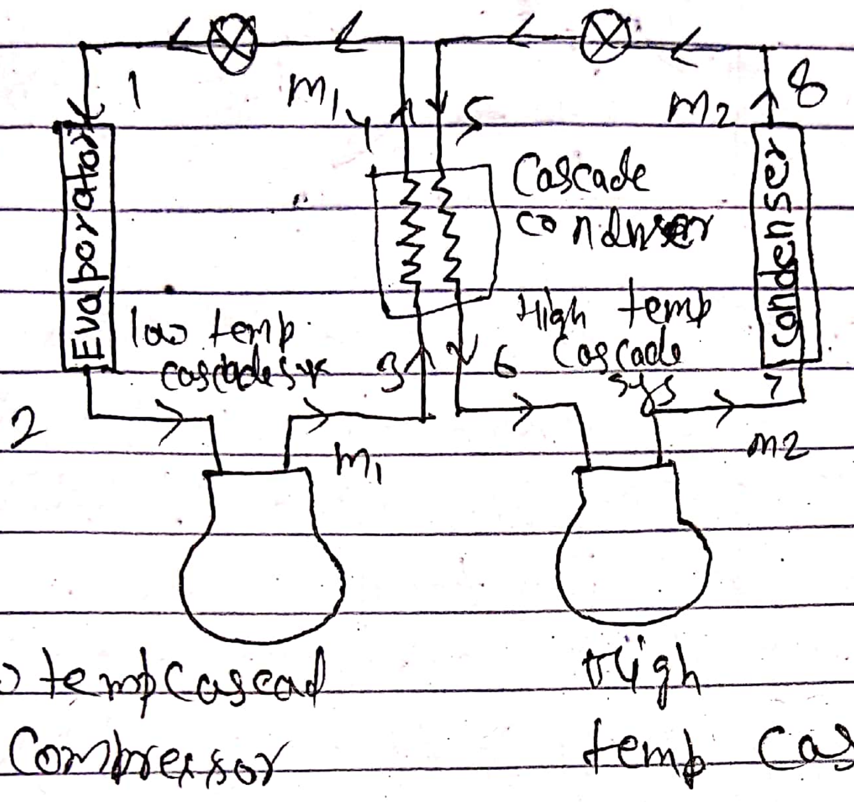
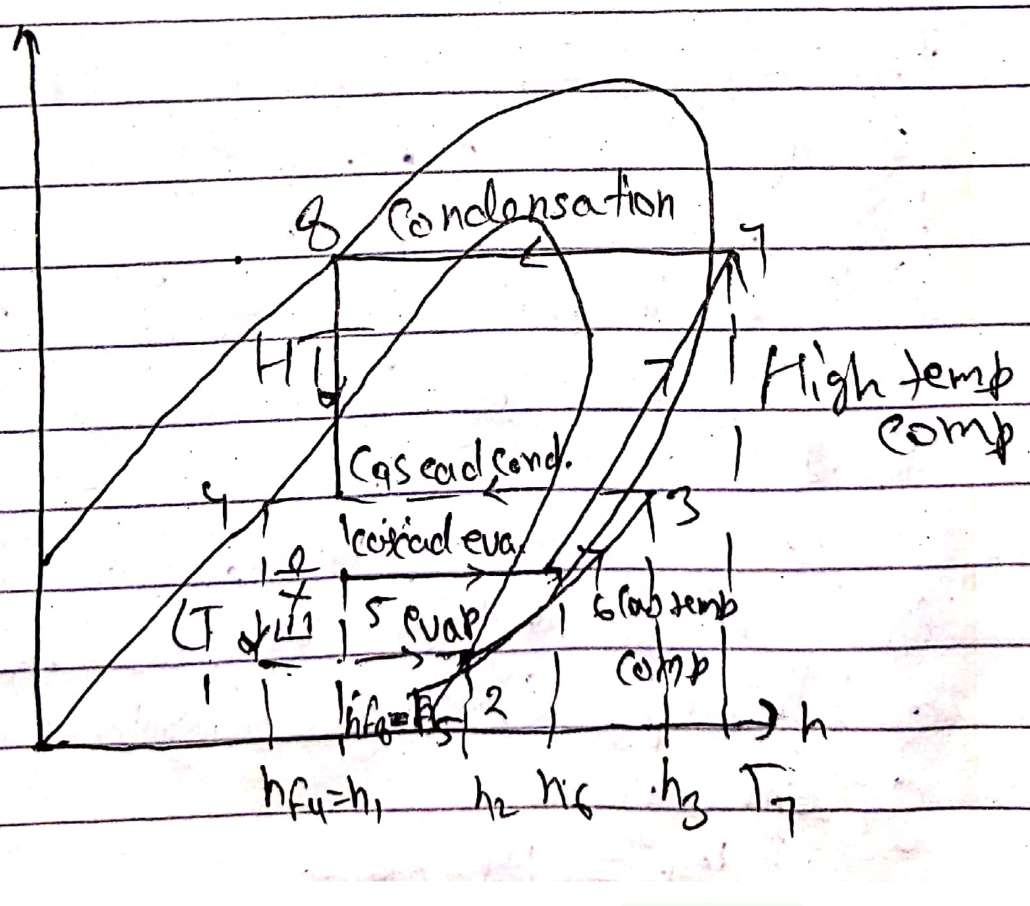
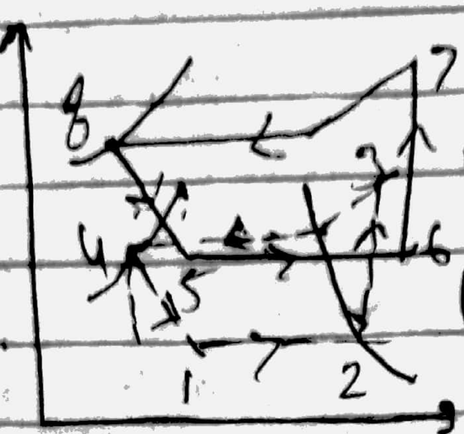
Sec-4-3 A4

# Cascade refrigeration system:-






The cascade ref sys consist of two or more vapour compression ref sys. in series which use ref. with progressively lower boilling temp.

In cascade ref sys. a cascade condenser serve as an evaporator for high temp and as a condenser for the low temp cascade system.

The difference b/w low ~~and~~ high temp cascade condenser ~~and~~ temp ~~of~~ high temp cascade evaporator temp is called temp overlap. If temp are equal so it is called intermediate temp.

If low temp cascade sys is under a ref. load of Q tonnes then the mass of reff ($m_1$) flowing through it is given by

$$m_1 = \frac{14000Q}{60(h_2 - h_1)} \text{ Kg/min.}$$

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Heat absorbed in the high temp. Cascade sys = Heat rejected in low temp Cascade sys.

i.e $m_2(h_6 - h_5) = m_1(h_3 - h_{f4})$

$$m_2 = \frac{m_1(h_3 - h_{f4})}{(h_6 - h_5)} = m_1 \frac{(h_3 - h_1)}{(h_6 - h_5)} \text{ kg/min}$$

Total work done

$$W = m_1(h_3 - h_2) + m_2(h_7 - h_6)$$

Power required to drive the sys.

$$P = \frac{m_1(h_3 - h_2) + m_2(h_7 - h_6)}{60} \text{ kW}$$

$$\text{reff. effect} = \frac{14000Q}{60} \text{ kJ/min.}$$

Coff. of performance.

$$COP = \frac{\text{Refrigeration effect}}{\text{work done}} = \frac{14000Q}{60[m_1(h_3 - h_2) + m_2(h_7 - h_6)]}$$