Week-1_Practice Problems

Please scan all pages (or take pictures) of your answer scripts (no need to type) and combine to one (1) PDF file. You need to upload the PDF file to the folder "**Students Submission of Practice Problems-1**" under the folder "**Assignments**" of CANVAS. **Deadline for submission: 18 Jan 10:00pm.**

Practice Problem-1: An ice-making machine operates on the ideal vapor-compression cycle using refrigerant-R134a. The refrigerant enters the compressor as saturated vapor at 140 kPa and leaves the condenser as saturated liquid at 700 kPa. Water enters the ice machine at 13°C and leaves as ice at -4°C. For an ice production rate of 9 kg/h, determine the power input to the ice machine (392 kJ of heat needs to be removed from each kg of water at 13°C to turn it into ice at -4°C). ***[Ans: 0.22 kW]***

Practice Problem-2: A vapour compression chiller plant includes a heat exchanger as shown in Figure-1. In order to superheat the saturated refrigerant vapour leaving the evaporator, it is proposed that the saturated liquid refrigerant leaving the condenser be used. The isentropic efficiency of the compressor is 75%. The enthalpies of refrigerant at different points of the cycle are given in Table-1. Specific heat capacity of water is 4.2 kJ/kg K.

i. The flow rate of water in the condenser water loop is 0.12 m^3/s. The temperatures of water at the inlet and outlet of the condenser are 30°C and 34°C, respectively. Calculate the flow rate of the refrigerant through the chiller system. ***[Ans: 10.97 kg/s]***

ii. The temperatures of chilled water at the outlet and inlet of the evaporator are 7°C and 11°C, respectively. Calculate the chilled water flow rate through the evaporator. ***[Ans: 0.0937 m^3/s]***

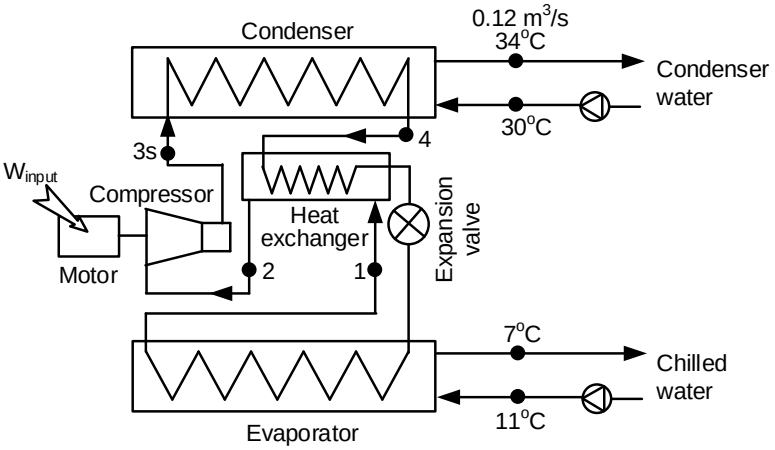

Figure-1 Water cooled chiller plant

Table-1 Enthalpies of refrigerant

Points	**Enthalpy, kJ/kg**
Point-1	398.4
Point-2	407.4
Point-3s (Entropy of point-2 and 3s are the same)	437.6
Point-4	263.9