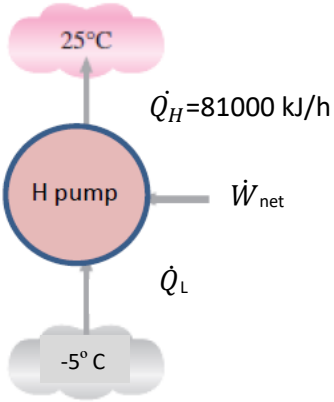
ÇANKAYA UNIVERSITY
DEPARTMENT OF MECHANICAL ENGINEERING
ME211 THERMODYNAMICS I
Quiz #5-soln

A heat pump is used to meet the heating requirements of a house and maintain it at 25°C. The house losses heat at a rate of 81000 kJ/h. If the heat pump has a coefficient of performance (COP) of 3, determine (a) the power consumed by the heat pump in kW and (b) the rate at which heat is absorbed from the cold outdoor air in kW.



Soln:

a) $COP = \frac{\dot{Q}_H}{\dot{W}} = 3$ where $\dot{Q}_H = 81000/3600 = 22,5$ kW

$COP = \frac{\dot{Q}_H}{\dot{W}} = \frac{22,5}{\dot{W}} = 3 \Rightarrow \dot{W} = \frac{22,5}{3} = 7,5$ kW.

b) $W = \dot{Q}_H - \dot{Q}_L \Rightarrow \dot{Q}_L = 22,5 - 7,5 = 15$ kW.