

# mech 262 – Assignment 6

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## Vapour Compression Refrigeration Cycle

### Question 1

An ice making machine operates on the ideal vapour-compression cycle using refrigerant R134a. The refrigerant enters the compressor as saturated vapour at 160 kPa and leaves the condenser as saturated liquid at 700 kPa. Water enters the ice machine at 15°C and leaves as ice at -5°C. For an ice production rate of 12 kg/hour, determine the power input to the ice maker.

(Note: 384 kJ of heat needs to be removed from each kilogram of water at 15°C to turn it into ice at -5°C.)

(Answer: 257.59 W)

### Question 2

A heat pump that operates on the ideal vapour-compression cycle with refrigerant R134a is used to heat a house and maintain it at 20°C, using underground water at 10°C as the heat source. The house is losing heat at a rate of 75,000 kJ/hour. The evaporator and condenser pressures are 320 kPa and 800 kPa respectively.

Determine:

- The power input to the heat pump;
- The heat pump's COP; and,
- The electric power saved by using a heat pump instead of electric baseboard heaters.

(Answers: 2.263 kW, 9.2, 18.57 kW)