ANNOUNCED QUIZ #7 – ME 3030 — Section 001 – Spring 2024

SOLUTION

NAME: _____

This is an open book quiz. You may use a four function calculator. An unsigned honors pledge will result in a zero.

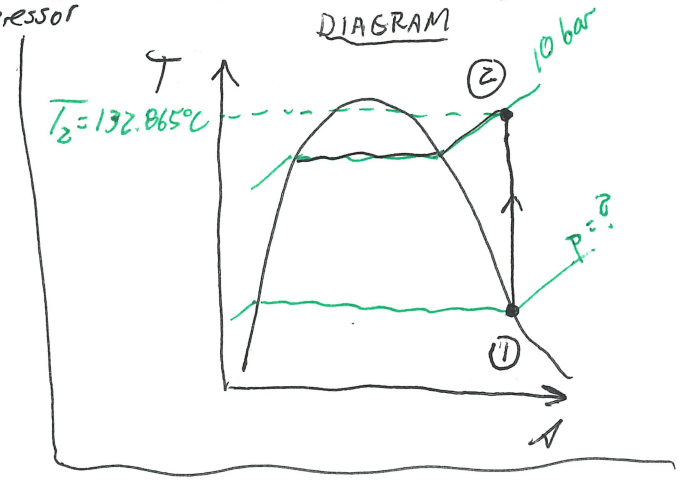
1. Consider an ideal vapor compression refrigeration cycle. The condenser pressure is 10.0 bar. Saturated vapor enters the compressor, and the compressor exit temperature is 132.865°C. If the working fluid is ammonia, compute the power input to the cycle in units if kJ/kg.

GIVEN: Condenser p; "g" state entering compressor; compressor exit T; NH_3.

FIND: $\dot{W}/\dot{m} = ?$ (Note $\dot{w}_{net}/\dot{m} = \dot{w}_c/\dot{m}$)

ASSUME: Ideal vapor compression assumptions, namely compressor is isentropic.

DIAGRAM



ANALYSIS: $\dot{W}_c/\dot{m} = h_2 - h_1$

From NH_3 tables

(2) $p_2 = 10$ bar, $T_2 = 132.865°C$

$h_2 = 1744.54$ kJ/kg

$s_2 = 5.8391$ kJ/kg·K } via interpolation

(1) Go to saturated tables and search for $s_g = 5.8391 \frac{kJ}{kg \cdot K}$. This occurs at p = 1 bar where $h_g = 1398.41$ kJ/kg $= h_1$

So, $\dot{W}_c/\dot{m} = 1744.54 \frac{kJ}{kg} - 1398.41 \frac{kJ}{kg}$

$\dot{W}_c/\dot{m} = 346.13$ kJ/kg ← ANS.

I HAVE NEITHER PROVIDED OR RECEIVED HELP DURING THIS QUIZ.

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SIGNATURE