ANNOUNCED QUIZ #6 – ME 3030 — Section 001 – Fall 2025

NAME: SOLUTION

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

1. Ammonia enters a turbine at 10.0 bar and 160.0°C and exits the turbine at a pressure of 1.00 bar and 20.00°C. What is the isentropic efficiency of the turbine?

GIVEN: P_1, T_1, P_2, T_2

FIND: $\eta_t = ?$

ASSUME: Assumptions coupled to η_t computation.

ANALYSIS: $\eta_t = \dfrac{h_1 - h_2}{h_1 - h_{2s}}$

DIAGRAM

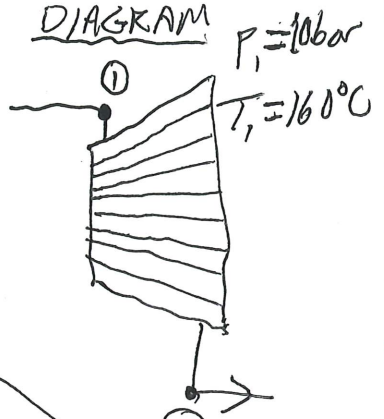

Table A-15

(1) $h_1 = 1810.94 \frac{kJ}{kg}$

$s_1 = 5.9981 \frac{kJ}{kg \cdot K}$

(2) $h_2 = 1515.80 \frac{kJ}{kg}$

$h_{2s} = h(p = 1.0 bar, s = 5.9981 \frac{kJ}{kg \cdot K})$

$p = 1.0$ bar

$h(kJ/kg)$	$s(kJ/kg \cdot K)$
1428.58	5.9616
(h_{2s})	5.9981
1439.50	6.0046

Interpolating

$$\frac{(6.0046 - 5.9616)\frac{kJ}{kg \cdot K}}{(1439.58 - 1428.58)\frac{kJ}{kg}} = \frac{(5.9981 - 5.9616)\frac{kJ}{kg \cdot K}}{(h_{2s} - 1428.58)\frac{kJ}{kg}}$$

Solving → $h_{2s} = 1437.92 \frac{kJ}{kg}$

$$\eta_t = \frac{(1810.94 - 1515.80)\frac{kJ}{kg}}{(1810.94 - 1437.92)\,kJ/kg} = 0.791$$

ANS. ↓ **0.791**

I HAVE NEITHER PROVIDED OR RECEIVED HELP DURING THIS QUIZ.

SIGNATURE