ANNOUNCED QUIZ #6 – ME 2030 –SECTION 001 – Fall 2024

NAME: SOLUTION

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

1. A sample of propane is at a pressure of 4 MPa and a temperature of 132°C. Obtain the specific volume of the sample using (i) the table for superheated propane and (ii) using the compressibili chart. Report your answers in units of m^3/kg.

GIVEN: Propane, P, T

FIND: $v = ?\ (m^3/kg)$ using tables and compressibility chart

ASSUME:

ANALYSIS: (i) From Table A-18 @ 4MPa = 40bar →

T(°C)	$v\ (m^3/kg)$
130	0.01344
132	v
140	0.01439

Using linear interpolation:

$$\frac{(0.01439 - 0.01344)\ m^3/kg}{(140°C - 130°C)} = \frac{v - 0.01344\ m^3/kg}{132°C - 130°C}$$

$$v = 0.01363\ m^3/kg \leftarrow \text{ANS.}$$

(ii) Compressibility chart.

From Table A-1 for propane, $T_c = 370K$; $P_c = 42.7bar$

$$P_R = \frac{40bar}{42.7bar} = 0.94$$

$$T_R = \frac{(132+273)K}{370K} = 1.09$$

} Fig A.1 → $Z = 0.73$

$$pv = ZRT \rightarrow v = \frac{ZRT}{P} = \frac{(0.73)\left(\frac{8314\ J/kg\cdot K}{44.09\ kg/kmol}\right)\overbrace{(132+273)}^{405K}K}{4\times10^6\ Pa}$$

$$v = 0.01394\ m^3/kg \leftarrow \text{ANS.}$$

I HAVE NEITHER PROVIDED OR RECEIVED HELP DURING THIS QUIZ.

SIGNATURE