2017 - 18 Sem I

1a) $T = 2.46°C$

$v = v_f + x v_{fg}$

$= 0.0007772 + 0.8(0.063604 - 0.0007772)$

$= 0.05103864\ m^3/kg$

$m = \dfrac{3 \times 10^{-3}}{0.05103864}$

$= 0.058778995 68 kg$

$\approx 0.0587 8 kg$

b) $\Delta P = P_2 - P_1$

$= 500 - 320$

$= 180 kPa$

$\Delta F = 180 \times 10^3 \times 40 \times 10^{-4}$

$= 720 N$

$F = kx$

$720 = 7.5 \times 10^3 x$

$x = 0.096 m$

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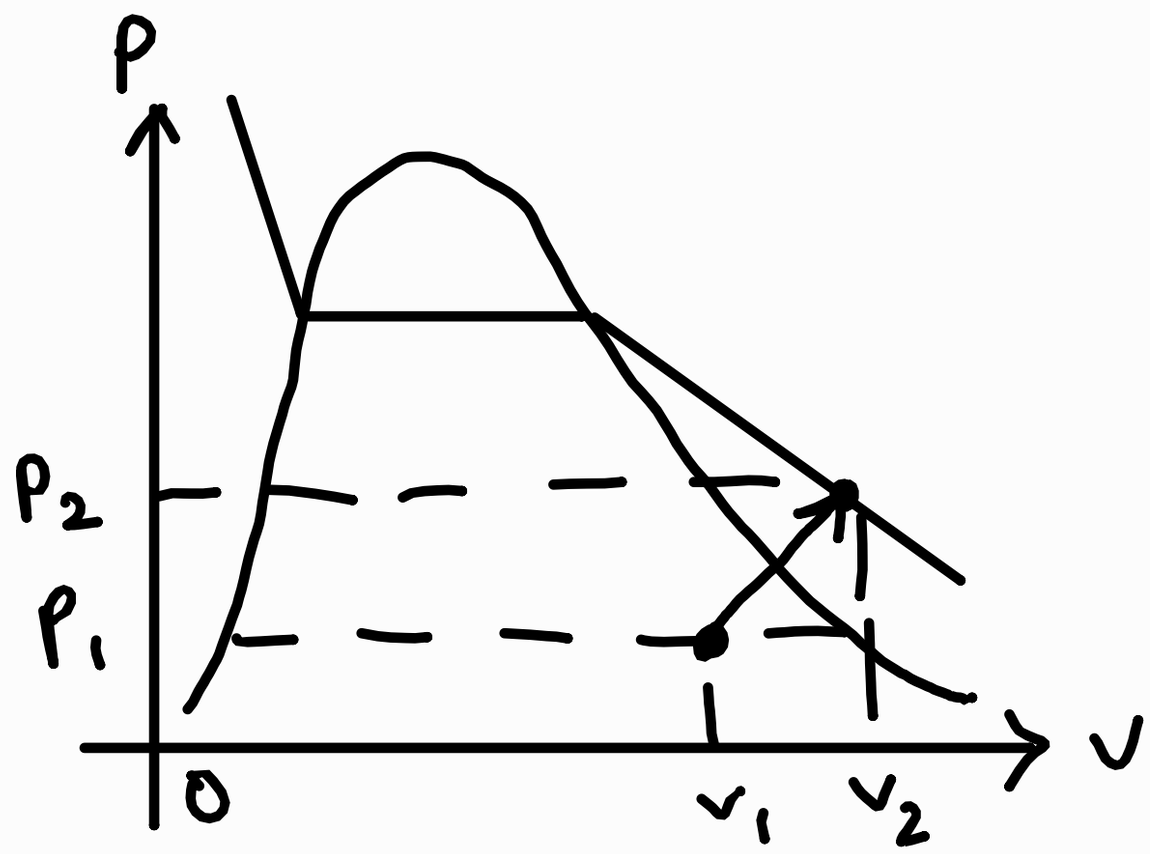
1c) $V_{final} = 3\times10^{-3} + 0.096\times40\times10^{-4}$

$= 3.384\times10^{-3}\ m^3$

$W0 = \frac{1}{2}(320+500)\times10^{3}(3.384-3)\times10^{-3}$

$= 157.44J$




1d) $v_{final} = \frac{3.384\times10^{-3}}{0.5878}$

$= 0.005757158592\ m^3/kg$

$\approx 0.0576 m^3/kg$

Volume ratio $= \frac{0.058053 - 0.005757158592}{0.058053 - 0.056205}$

$= 0.2605054545$

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(d) $\frac{311.50 - u_2}{311.50 - 302.51} = 0.260505454545$

$u_2 = 309.158056 kJ/kg$

$Q - W = m(u_2 - u_1)$

$Q = m(u_2 - u_1) + W$

$= 0.05878(309.158056 - (54.92 + 0.8(176.61))) + 157.44 \times 10^{-3}$

$= 6.796530854 kJ$

$\approx 6.80 kJ$

$\frac{100 - T_2}{100 - 90} = 0.260505454545$

$T_2 = 97.394945545 °C$

$\approx 97.4 °C$

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(e) $V_{initial} = \dfrac{0.05 \times 0.287 \times 10^3 \times (273.15 + 33)}{100 \times 10^3}$

$= 0.043932525\ m^3$

$V_{final} = 0.043932525 - 0.096 \times 40 \times 10^{-4}$

$= 0.043548525\ m^3$

$P_1 V_1^n = P_2 V_2^n \quad - (1)$

$\dfrac{P_1 V_1}{T_1} - \dfrac{P_2 V_2}{T_2}$

$\dfrac{T_2}{T_1} = \dfrac{P_2 V_2}{P_1 V_1}$

2016 - 17 Sem II

1a) $T = 105.97^{\circ}$

$$v = v_f + x v_{fg}$$

$$= 0.0010\,48 + 0.85(1.3750 - 0.0010\,48)$$

$$= 1.168\,9072\ m^3/kg$$

$$m = \frac{9 \times 10^{-3}}{1.168\,9072}$$

$$= 7.699\,4991\,56 \times 10^{-3}\ kg$$

b) $\Delta V = 60 \times 10^{-4} \times 0.3$

$$= 1.8 \times 10^{-3}\ m^3$$

$$V_{final} = 9 \times 10^{-3} + 1.8 \times 10^{-3}$$

$$= 10.8 \times 10^{-3}\ m^3$$

$$v_{final} = \frac{10.8 \times 10^{-3}}{7.699\,4991\,56 \times 10^{-3}}$$

$$= 1.402\,688\,864\ m^3$$

Since $v_{final} > v_g$,

The state of subsystem B is superheated vapour.