



Complete, fold and seal
(see note 2 below)

SURNAME: Price

FORENAME(S): Joshua Aled

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. **Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.**

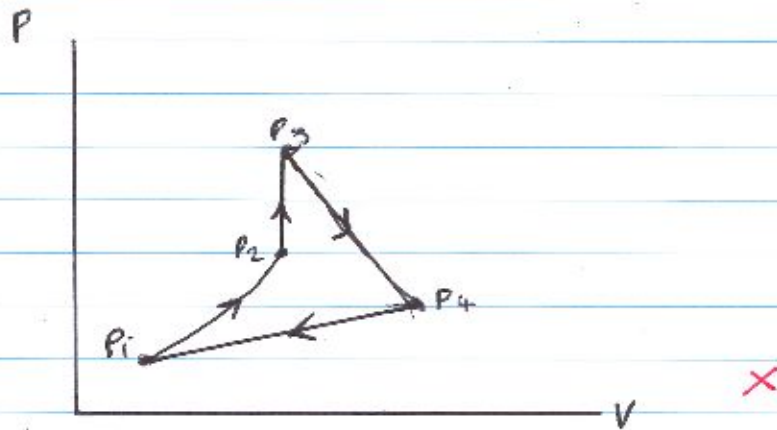
1	Student Number	188780
2	Title of Examination Paper	Thermofluids 1
3	Module Code	L4 SGDM4004
4	Date and Time of Examination	16/1/20 9:30 am - 11:30 am
5	Examination Venue	
6	Seat Number	
7	Number of Answer Books handed in	

List the numbers of the questions you have attempted	Office Use
2	2
3	2
4	8
Total	12/75

16%

2.

a)



$$P_1 = 1 \times 10^5 \text{ N} \quad V_1 = 0.65 \text{ m}^3$$

$$P_2 = 5 \times 10^5 \text{ N} \quad V_2 = 0.15 \text{ m}^3$$

$$P_3 = 8 \times 10^5 \text{ N} \quad V_3 =$$

$$P_4 = 2.5 \times 10^5 \text{ N} \quad V_4 =$$

$$\frac{P_1 V_1}{n-1} = \frac{P_2 V_2}{n-1} \quad \frac{(1 \times 10^5 \times 0.65) - (5 \times 10^5 \times V_2)}{1.1 - 1}$$

$$\frac{65000 - (500000 \times V_2)}{0.1}$$

$$V_2 = \sqrt[0.2]{65000 - 500000} = 240.440$$

$$P_1 V_1^n = P_2 V_2^n \quad \checkmark$$

$$\frac{P_1 V_1^n}{P_2} = V_2^n = \frac{1 \times 10^5 \times 0.65^{1.1}}{5 \times 10^5} = V_2^{1.1} = 0.125 \quad \checkmark$$

$$V_2 = \sqrt[1.1]{0.125} = 0.15 \text{ m}^3$$

$$W = \frac{P_1 V_1 - P_2 V_2}{n-1} = \frac{1 \times 10^5 \times 0.65 - 5 \times 10^5 \times 0.15}{0.1} = -100000 \text{ N} \quad \textcircled{2}$$

$$V_3 = \frac{P_2 V_2^n}{P_3} = V_3^n = \frac{5 \times 10^5 \times 0.15^{2.2}}{8 \times 10^5} = V_3^{2.2} = \frac{9.62 \times 10^{-3}}{8 \times 10^5}$$

$$V_3 = \sqrt[2.2]{\frac{9.62 \times 10^{-3}}{8 \times 10^5}} = 0.12 \text{ m}^3$$

$$1 \times 10^5 \times 0.65^{2.2}$$

- b) Work is being done on the system as it is not positive, therefore getting Less work out than what is put in. x

2

4.

- a) A perfect gas is when heat, temperature and volume is constant. The specific heat is how much energy is needed to heat a specified gas / liquid.

2

- b) A closed system is one that does not lose contained energy, such as a cylinder. An open system lets the energy escape and work externally, like a turbine.

2

c) $P_1 = 10 \times 10^5$ $T_1 = 423 \text{ K}$ $V_1 = 0.25 \text{ m}^3$
 $P_2 = ?$ $T_2 = ?$ $V_2 = 0.85 \text{ m}^3$

$$PV = mRT$$

$$\gamma = C_p / C_v = 1.378 \times 10^3$$

$$R = C_p - C_v = 0.295 \times 10^3$$

1

$$\frac{T_1}{T_2} = \left[\frac{V_2}{V_1} \right]^{\gamma-1}$$

$$T_2 = T_1 \times \left[\frac{V_2}{V_1} \right]^{\gamma-1}$$

$$T_2 = 423 \times \left[\frac{0.85}{0.25} \right]^{1.378 \times 10^3 - 1}$$

$$m = \frac{PV}{RT}$$

$$m = \frac{10 \times 10^5 \times 0.25}{0.295 \times 10^3 \times 423} = 2.003 \text{ kg}$$

3

8



3.

a) Energy cannot be lost, it must work on something $P_1 V_1 = P_2 V_2$

(1)

b) i) Adiabatic Process - The volume stays the same and pressure & ~~volume~~ temperature change

ii) Enthalpy -

iii) Isothermal - constant Temperature and pressure & volume change

(1)

iv) Absolute Temperature -

$$c) P_1 = 7 \times 10^5 \text{ N/m}^2 \quad T_1 = 2473 \text{ K}$$

$$P_2 = 1 \times 10^5 \text{ N/m}^2 \quad T_2$$

$$\gamma = C_p / C_v = 1.4 \times 10^3$$

$$R = C_p - C_v = 0.29 \times 10^3$$

 2
