

**INSTRUCTION:**

This section consists of **FOUR (4)** structured questions. Answer **ALL** questions.

**ARAHAN:**

Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **SEMUA** soalan.

**QUESTION 1****SOALAN 1**

|      |                                                                                                                                                                                                                                                                                                                                                         |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CLO1 | <p>(a) Describe<br/><i>Terangkan</i></p> <p>i. Boyle's Law / <i>Hukum Boyle</i><br/>[2 marks]<br/>[2 markah]</p> <p>ii. Extensive properties / <i>Sifat ekstensif</i><br/>[2marks]<br/>[2 markah]</p>                                                                                                                                                   |
| CLO1 | <p>(b) Explain <b>THREE (3)</b> properties together with the molecular diagram for the:<br/><i>Jelaskan TIGA (3) sifat berserta rajah molekul untuk:</i></p> <p>i. Liquid Phase / <i>Fasa Cecair</i><br/>[4 marks]<br/>[4 markah]</p> <p>ii. Steam Phase / <i>Fasa Stim</i><br/>[4 marks]<br/>[4 markah]</p>                                            |
| CLO1 | <p>(c) Calculate the specific enthalpy (s), the specific volume (v) and the specific internal energy (u) when given superheated steam at 360 bar and 500°C.<br/><i>Kirakan entalpi tentu (h), isipadu tentu (v) dan tenaga dalaman tentu (u) apabila diberi keadaan stim panas lampau pada 360 bar dan 500°C.</i></p> <p>[13 marks]<br/>[13 markah]</p> |

## QUESTION 2

## SOALAN 2

CLO1

- (a) The 2 main concepts in the First Law of Thermodynamics are the Non-Flow Process and the Flow Process. Explain the difference between:

*2 konsep utama dalam Hukum Termodinamik Pertama ialah Proses Tak Alir dan Proses Alir. Terangkan perbezaan antara:*

- i. Non-Flow Process with equations.

*Proses Bukan Aliran dengan persamaan.*

[3 marks]

[3 markah]

- ii. Flow Process with equations.

*Proses Aliran dengan persamaan.*

[3 marks]

[3 markah]

CLO1

- (b) Steam at 90 bar and enthalpy 2681 kJ/kg expand isothermally and reversible to a pressure of 7 bar.

*Stim pada 90 bar dan entalpi 2681 kJ/kg mengembang secara isothermal dan boleh balik kepada tekanan 7 bar.*

- i. Calculate the entropy change and heat supply.

*Kira perubahan entropi dan bekalan haba.*

[12 marks]

[12 markah]

- ii. Sketch the process on a T-s diagram and indicate the area representing the heat flow.

*Lakarkan proses pada gambar rajah T-s dan tunjukkan kawasan yang mewakili aliran haba.*

[7 marks]

[7 markah]

**QUESTION 3****SOALAN 3**

CLO1

(a) Define the following terms with an example:

*Takrifkan istilah berikut beserta contoh:*i. *steady flow**aliran mantap*

[3 marks]

[3 markah]

ii. *unsteady flow**aliran tak mantap*

[3marks]

[3 markah]

CLO1

(b) Consider a steam power plant operating on the Carnot Cycle. A steam enters the turbine at 34 bar and exits the condenser at 0.045 bar. Approximate cycle efficiency and work done by the turbine.

*Andaikan kendalian loji kuasa stim beroperasi dengan Kitaran Carnot. Suatu stim memasuki sebuah turbin pada tekanan 34 bar dan keluar melalui kondenser pada tekanan 0.045 bar. Anggarkan kecekapan kitaran dan kerja yang dilakukan oleh turbin.*

[11 marks]

[11 markah]

CLO1

- (c) Steam steadily enters the turbine at 4600 kg/hour and produces a power output of 1000 kJ/kg. Steam at the entrance is as follows:

Flow velocity 250 m/s, 8.5 bar pressure, energy in 2300 kJ/kg and specific volume  $0.55 \text{ m}^3/\text{kg}$ .

Steam on the exit is as follows:

Flow velocity 125 m/s, 2.3 bar pressure, energy in 1700 kJ/kg and specific volume of  $1.75 \text{ m}^3 / \text{kg}$ .

Calculate the value of heat transferred to the environment if the energy is small and negligible.

*Stim mengalir secara mantap memasuki turbin dengan kadar 4600 kg/jam dan menghasilkan kuasa keluaran sebanyak 1000 kJ/kg. Stim pada bahagian masuk berkeadaan seperti berikut:*

*Halaju aliran 250 m/s, tekanan 8.5 bar, tenaga dalam 2300 kJ/kg dan isipadu tentu  $0.55 \text{ m}^3/\text{kg}$ .*

*Stim pada bahagian keluar pula berkeadaan seperti berikut:*

*Halaju aliran 125 m/s, tekanan 2.3 bar, tenaga dalam 1700 kJ/kg dan isipadu tentu  $1.75 \text{ m}^3/\text{kg}$ .*

*Hitungkan nilai haba yang dipindahkan ke sekitaran sekiranya tenaga keupayaan kecil dan boleh diabaikan.*

[8 marks]

[8 markah]

**QUESTION 4****SOALAN 4**

CLO1

- (a) Approximate K and K
- <sub>p</sub>
- for each reaction



at 27°C, the equilibrium concentration of NO = 1.29 M, Br<sub>2</sub> = 10.52 M, and NOBr = 0.423 M.

*Anggarkan nilai K dan K<sub>p</sub> untuk setiap tindak balas*



*pada 27°C, kepekatan keseimbangan of NO adalah 1.29 M, Br<sub>2</sub> = 10.52 M dan NOBr = 0.423 M*

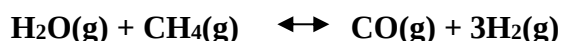
[15 marks]

[15 markah]

- (b) Given the equilibrium equation

*Diberi persamaan keseimbangan*

CLO1



In equilibrium at 700K, reactions occurred at 0.31 atm H<sub>2</sub>O, 0.70 atm CH<sub>4</sub>, 0.12 atm CO and 0.38 atm H<sub>2</sub>. Calculate:

*Di dalam keseimbangan pada suhu 700K, tindakbalas berlaku pada 0.31 atm H<sub>2</sub>O, 0.70 atm CH<sub>4</sub>, 0.12 atm CO dan 0.38 atm H<sub>2</sub>. Kirakan:*

- i. the value of K
- <sub>p</sub>
- / nilai K
- <sub>p</sub>

[2 marks]

[2 markah]

- ii. the equilibrium constant equation for the reverse reaction at same temperature.

*persamaan pemalar keseimbangan bagi tindakbalas berbalik pada suhu yang sama*

[2 marks]

[2 markah]

- iii. the value of K
- <sub>c</sub>
- / nilai K
- <sub>c</sub>

[6 marks]

[6 markah]

**SOALAN TAMAT**