

SECTION A: 100 MARKS
BAHAGIAN A: 100 MARKAH

INSTRUCTIONS:

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

ARAHAN:

Bahagian ini mengandungi EMPAT (4) soalan. Jawap SEMUA soalan.

QUESTION 1

SOALAN 1

CLO1
C1

- (a) Define the following terms:
Takrifkan terma-terma berikut:

i. Liquid
Cecair

[2 marks]

[2 markah]

ii. Gas
Gas

[2 marks]

[2 markah]

CLO1
C2

- (b) Using a Pressure Diagram, explain the relationship between Absolute Pressure, Gauge Pressure and Atmospheric Pressure.

Terangkan secara Gambar Rajah Tekanan hubungan antara Tekanan Mutlak, Tekanan Tolok dan Tekanan Atmosfera.

[6 marks]

[6 markah]

CLO2
C2

(c) Explain the following terms by using the most suitable formula:

*Jelaskan terma berikut dengan formula yang bersesuaian:*i. Specific volume, v *Isipadu tentu, v*

[2 marks]

[2 markah]

ii. Specific weight, ω *Berat tentu*

[2 marks]

[2 markah]

iii. Specific gravity, S *Graviti tentu, S*

[2 marks]

[2 markah]

CLO2
C3(d) The specific weight of a fluid is $35 \times 10^3 \text{ N/m}^3$ and the volume is 150 cm^3 . Calculate:*Berat tentu suatu bendalir ialah $35 \times 10^3 \text{ N/m}^3$ dan isipadu bendalir ialah 150 cm^3 . Kirakan:*i. Mass of fluid, m *Jisim bendalir, m*

[3 marks]

[3 markah]

ii. Mass density of fluid, ρ *Ketumpatan jisim bendalir, ρ*

[3 marks]

[3 markah]

iii. Specific volume of fluid, v *Isipadu tentu bendalir, v*

[3 marks]

[3 markah]

QUESTION 2

SOALAN 2

CLO2
C1

- (a) Define the following terms:
Takrifkan terma yang berikut:

i. Pascal's Law
Hukum Paskal

[2 marks]

[2 markah]

ii. Archimedes Principle
Prinsip Archimedes

[2 marks]

[2 markah]

CLO2
C2

- (b) A force of 850 N is applied to the smaller cylinder of a jack hydraulic. The area, A_1 of small piston is 80 cm^2 and the diameter of a large piston, D_2 is 800 mm. Express the value of load, W that can be lifted by the large piston if:

Suatu daya 850 N dikenakan pada silinder kecil sebuah jek hidraulik. Luas omboh kecil, A_1 adalah 80 cm^2 dan diameter omboh besar, D_2 adalah 800 mm. Nyatakan nilai bagi beban, W yang boleh diangkat oleh omboh besar jika:

i. Pistons are at the same level
Kedua-dua omboh pada aras yang sama

[4 marks]

[4 markah]

ii. The large piston is 0.75 m below the small piston
Omboh besar berada 0.75 m di bawah omboh kecil

[3 marks]

[3 markah]

iii. The large piston is 0.32 m above the small piston
Omboh besar berada 0.32 m di atas omboh kecil

[3 marks]

[3 markah]

CLO2
C3

- (c) An inverted tube differential manometer as shown in **Figure 2(c)** which contains mercury of specific gravity of 13.6 is connected to different pipes which contains oil with specific gravity of 0.9. Calculate the pressure in Pipe B. The pressure in Pipe A is 3 kPa.

*Manometer tiub terbalik seperti di dalam **Rajah 2(c)** mengandungi merkuri dengan gravity tentu 13.6 disambung dengan dua titik paip berbeza yang mengandungi minyak dengan gravity tentu 0.9. Kirakan tekanan paip di B. Tekanan paip di A adalah 3 kPa.*

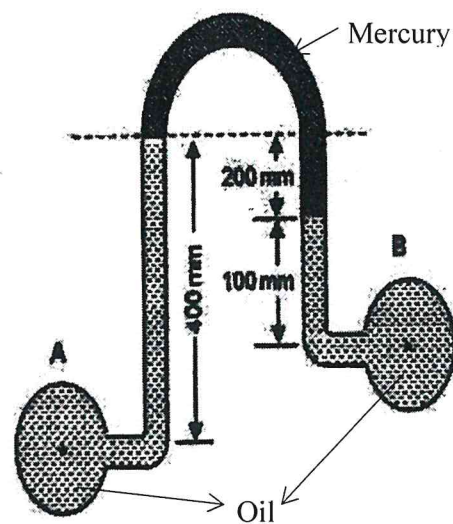


Figure 2(c) / Rajah 2(c)

[11 marks]

[11 markah]

QUESTION 3

SOALAN 3

CLO2
C1

(a) Define the following terms:

Takrifkan terma-terma berikut:

i. Discharge

Kadar alir

[2 marks]

[2 markah]

ii. Mass flow rate

Kadar alir jisim

[2 marks]

[2 markah]

iii. Continuity equation

Persamaan keterusan

[2 marks]

[2 markah]

CLO2
C2

(b) Water flow in a pipe PQ splits into 2 pipes which are QR and QS as shown in **Figure 3(b)**. Given the diameter of pipe PQ at P is 0.75 m, the diameter of pipe PQ at Q is 0.5 m, the diameter of pipe QR is 0.2 m and the diameter of pipe QS is 0.35 m. Express the value of:

*Aliran air yang melalui sebatang paip PQ telah dipisahkan kepada dua paip iaitu QR dan QS seperti ditunjukkan dalam **Rajah 3(b)**. Diberi diameter paip PQ di P ialah 0.75 m, diameter paip PQ di Q ialah 0.5 m, diameter paip QR ialah 0.2 m dan diameter paip QS ialah 0.35 m. Nyatakan nilai bagi:*

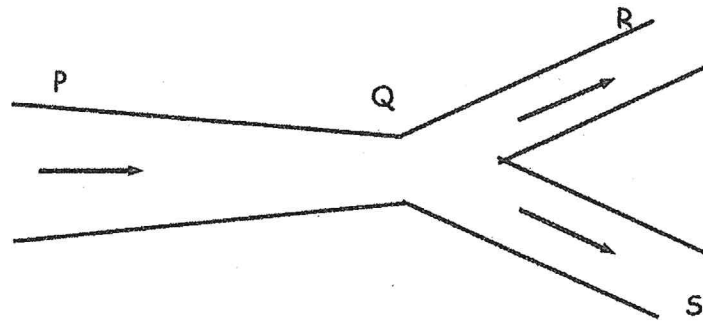


Figure 3(b) / Rajah 3(b)

- i. The discharge at section P if $v_P = 5$ m/s.
Kadar alir pada bahagian P jika $v_P = 5$ m/s.

[3 marks]

[3 markah]

- ii. The velocity at section S if $v_{QR} = 8$ m/s.
Halaju pada bahagian S jika $v_{QR} = 8$ m/s.

[6 marks]

[6 markah]

CLO2
C3

- (c) A venturi meter measures the flow of oil for specific gravity of 0.86. Its entrance and throat areas are $17.67 \times 10^{-3} \text{ m}^2$ and $1.96 \times 10^{-3} \text{ m}^2$ respectively. If the coefficient for the meter is 0.98 and the pressure difference is 34.5 kN/m^2 , calculate the actual discharge in m^3/s .

Meter venturi digunakan untuk mengukur kadar alir minyak yang mempunyai graviti tentu 0.86. Luas bahagian masuk dan leher ialah $17.67 \times 10^{-3} \text{ m}^2$ dan $1.96 \times 10^{-3} \text{ m}^2$. Jika pekali meter ialah 0.98 dan perbezaan tekanan ialah 34.5 kN/m^2 , hitungkan kadar alir sebenar dalam unit m^3/s .

[10 marks]

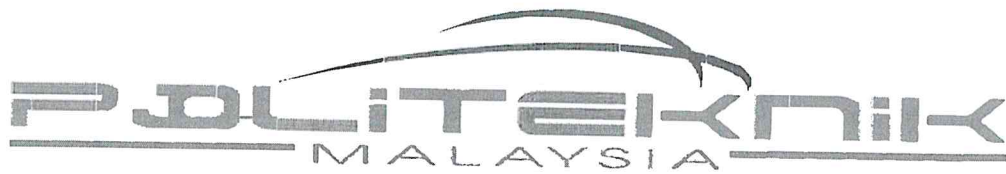
[10 markah]

QUESTION 4

SOALAN 4

- CLO2
C1
- (a) List **FIVE (5)** types of energy loss.
Senaraikan LIMA (5) jenis kehilangan tenaga.
- [5 marks]
[5 markah]
- CLO2
C2
- (b) A horizontal pipe which carries $0.25 \text{ m}^3/\text{s}$ water changed suddenly from 200 mm diameter to 400 mm diameter pipe. Express the value of head loss due to the sudden enlargement.
Sebatang paip mendatar membawa $0.25 \text{ m}^3/\text{s}$ air berubah secara mendadak daripada diameter 200 mm kepada 400 mm. Nyatakan nilai bagi kehilangan turus disebabkan oleh pembesaran mendadak.
- [8 marks]
[8 markah]
- CLO2
C3
- (c) Water from a large reservoir is discharged to atmosphere through a 100 mm diameter and 550 m long pipe. The entry point from the reservoir to the pipe is sharp and the outlet is 8 m below the surface level in the reservoir. Taking $f = 0.01$ in the Darcy Formula, calculate the discharge rate.
Air daripada sebuah takungan yang besar disalurkan ke atmosfera melalui paip sepanjang 550 m dan bergaripusat 100 mm. Salur masuk paip dari takungan adalah tajam dan salur keluar berada pada 8 m di bawah permukaan takungan. Dengan mengambil nilai $f = 0.01$ daripada Formula Darcy, kirakan kadar alir.
- [12 marks]
[12 markah]

SOALAN TAMAT



LIST OF FORMULAS
DJJ20073 - FLUID MECHANICS

<p>FLUID PROPERTIES</p> $S = \frac{\omega_{\text{substance}}}{\omega_{\text{water}}}$	<p>FLUID STATICS</p> $F_b = \rho g V$
<p>FLUID DYNAMICS</p> $z_1 + \frac{P_1}{\omega} + \frac{v_1^2}{2g} = z_2 + \frac{P_2}{\omega} + \frac{v_2^2}{2g}$ $Q_{\text{Actual}} = C_d (Q_{\text{Theory}})$ $Q_{\text{Theory}} = A_1 \sqrt{\frac{2gH}{(\omega^2 - 1)}}$ $H = \frac{P_1 - P_2}{\omega_{\text{sub}}} + (z_1 - z_2) = x \left[\frac{\omega_{Hg}}{\omega_{\text{sub}}} - 1 \right]$	<p>ENERGY LOSSES IN PIPELINE</p> $h_L = \frac{(v_1 - v_2)^2}{2g}$ $h_c = \left[\frac{1}{c_c} - 1 \right]^2 x \frac{v^2}{2g}$ $h_f = \frac{4fL v^2}{d 2g}$ $h_i = \frac{1}{2} \left[\frac{v^2}{2g} \right]$ $h_o = \frac{v^2}{2g}$