INSTRUCTION:

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

ARAHAN:

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

QUESTION 1

SOALAN 1

CLO1
C1

(a) State the existing physical properties of fluid.

Nyatakan sifat-sifat fizikal bendalir yang sedia ada.

[5 marks]
[*5 markah*]

CLO1
C2

(b) Assume atmospheric pressure is standard. Determine the pressure in kN/m^2 for the pressure below:

Dengan anggapan tekanan atmosfera adalah standard. Tentukan tekanan dalam kN/m^2 untuk tekanan berikut:

i. Depth 6 m below free space water.

Kedalaman 6 m bawah permukaan air.

[3 marks]
[*3 markah*]

ii. At the 9 m surface of oil with specific gravity 0.75.

Pada kedalaman 9 m bawah permukaan minyak yang mempunyai gravity spesifik 0.75.

[7 marks]
[*7 markah*]

CLO1
C3

(c) One liter of oil weighs 8.70 N. Calculate its specific weight, mass density and specific gravity.

Satu liter minyak seberat 8.70 N. Kirakan berat tentu, ketumpatan jisim dan graviti tentu bagi minyak tersebut.`

[10 marks]
[*10 markah*]

QUESTION 2

SOALAN 2

CLO1
C1

(a) Define the following terms:

Definisikan istilah yang berikut:

i. Pascal's Law

Hukum Pascal

[3 marks]
[*3 markah*]

ii. Buoyancy force

Daya keapungan

[2 marks]
[*2 markah*]

CLO1
C2

(b) A force, P of 650 N is applied to a small cylinder of the hydraulic jack. The area, '*a*' of small piston is 15 cm^2 and the area, '*A*' of a large piston is 150 cm^2. What is the load of W that can be lifted at a large piston if :

Satu daya, P sebanyak 650 N dikenakan pada selinder kecil sebuah jek hidraulik. Luas omboh kecil, a adalah 15cm^2 dan luas omboh besar, A adalah 150 cm^2. Berapakah beban, W yang boleh diangkat oleh omboh besar jika:

i. The pistons are at the same level?

Kedua –dua omboh pada aras yang sama?

[5 marks]
[5 markah]

ii. The small piston is 0.40 m below the larger piston?

Omboh kecil 0.40 m dibawah omboh besar?

[*5 marks*]
[*5markah*]

CLO1
C3

(c) Figure 2(c) shows a differential manometer of water (Fluid P) and mercury (Fluid Q) is used. If pressure difference between point A and B is 47 kNm^{-2}, h = 1.2 m and a = 42 cm, find the level value of b. (specific gravity of mercury = 13.6)

Rajah 2(c) menunjukkan satu manometer kebezaan air (cecair P) dan merkuri(Fluid Q) digunakan. Jika perbezaan tekanan di antara titik A dan B ialah 47 kNm^{-2}, h = 1.2 m dan a = 42 cm, tentukan nilai aras, b. (graviti tentu merkuri = 13.6)

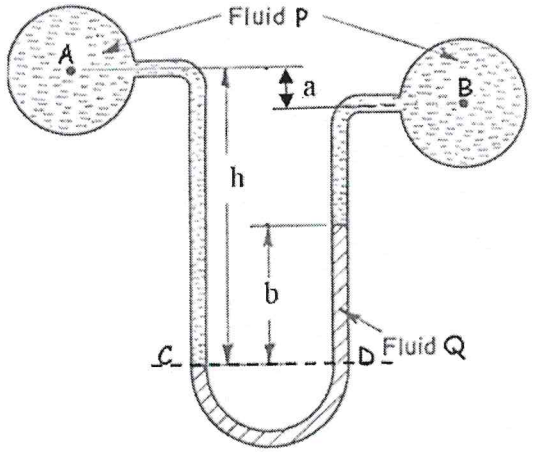

Figure 2 (c)
Rajah 2 (c)

[10 marks]
[*10 markah*]

QUESTION 3

SOALAN 3

CLO1
C1

(a) Define with sketch the following terms:

Takrifkan istilah-istilah berikut beserta gambarajah:

i. Laminar flow / *Aliran Lamina*

[2.5 marks]
[*2.5 markah*]

ii. Turbulent flow / *Aliran Gelora*

[2.5 marks]

[*2.5 markah*]

CLO1
C2

(b) Figure 3(b) shows a round pipe A with a diameter of 20 mm. Oil flow splits into two at the end of the pipe. Pipe B with a diameter of 10 mm has a Velocity, V_B = 0.28 ms^{-1} and pipe C with diameter 15 mm has Velocity, V_C = 0.55 ms^{-1}. Determine the velocity in the pipe A (V_A), flow rate in the pipe B (Q_B) and discharge from the pipe C (Q_c).

Rajah 3(b) menunjukkan paip A berbentuk bulat dengan diameter 20 mm. Paip itu yang mengalirkan minyak berpisah kepada dua paip di penghujung paip A tersebut. Paip B dengan diameter 10 mm dengan halaju, V_B = 0.28 ms^{-1} dan paip C dengan diameter 15 mm dengan halaju, V_C = 0.55 ms^{-1}. Tentukan halaju pada paip A (V_A), kadar alir pada paip B (Q_B) serta kadar alir keluar di paip C (Q_C).

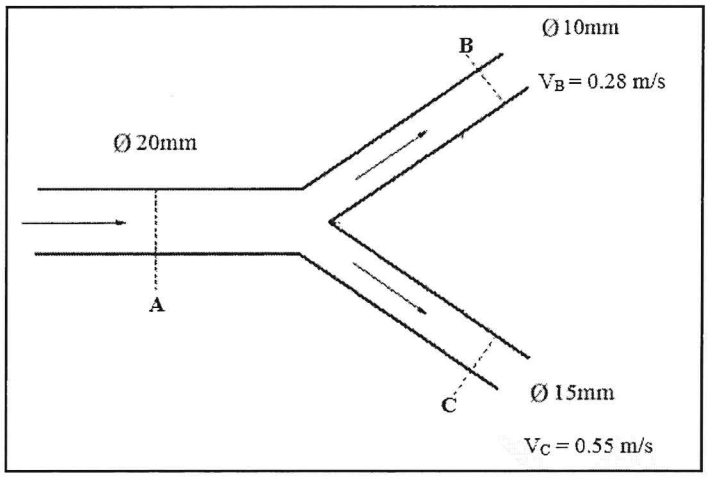

Figure 3(b)
Rajah 3 (b)

[10 marks]
[*10 markah*]

CLO1
C3

(c) The kerosene flow rate is measured by a horizontal ventury meter in Figure 3(c). The pipe diameter and the neck are 50 mm and 25 mm. The mercury manometer reading shows 55 mm. The flowrate coefficient is 0.96. Find the kerosene flow rate. Consider the density of kerosene is 820 kgm^{-3}.

Kadar alir kerosin di ukur oleh satu meter venturi mendatar seperti dalam Rajah 3 (c). Diameter paip dan leher ialah 50 mm dan 25 mm. Bacaan pada manometer raksa menunjukkan 55 mm. Pekali kadar alir ialah 0.96. Carikan kadar alir kerosin. Ambil kira ketumpatan kerosin 820 kgm^{-3}.

[10 marks]
[*10 markah*]

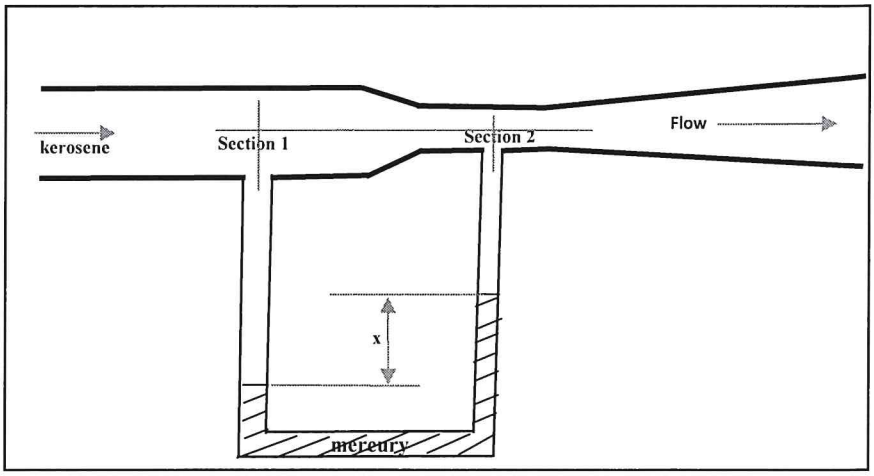

Figure 3(c)
Rajah 3 (c)

QUESTION 4

SOALAN 4

CLO1
C1

(a) State **FIVE (5)** head loss in the pipeline system.

*Nyatakan **LIMA (5)** kehilangan turus di dalam sistem paip.*

[5 marks]
[*5 markah*]

CLO1
C2

(b) A pipeline carrying 0.235 m^3s^{-1} is reduced suddenly from 420mm diameter to 280mm
diameter pipe. (Take Cc = 0.67). Determine;

Sebatang paip mendatar membawa 0.235 m^3s^{-1} air mengecil secara mendadak daripada diameter 420mm kepada 280mm, (Ambil Cc = 0.67). Tentukan;

i. The head loss due to the sudden contraction.

Kehilangan turus disebabkan oleh pengecilan mendadak.

[6 marks]
[*6 markah*]

ii. Pressure difference between the two pipes.

Perbezaan tekanan di antara kedua-dua paip tersebut.

[4marks]
[*4 markah*]

CLO1
C3

(c) Water from a large reservoir is discharged to atmosphere through a 150 *mm* diameter and 450m long pipe. The entry from the reservoir to the pipe is sharp and the outlet is 10m below the surface level in the reservoir. Taking $f = 0.01$ in the Darcy formula, calculate the discharge.

Air daripada sebuah takungan yang besar disalurkan ke atmosfera melalui paip sepanjang 450m dan bergarispusat 150mm. Salur masuk paip dari takungan adalah tajam dan salur keluar berada pada 10m di bawah permukaan air kolam. Dengan mengambil nilai $f = 0.01$ daripada persamaan Darcy, kirakan kadaralir.

[10 marks]
[*10 markah*]

SOALAN TAMAT

POLITEKNIK MALAYSIA

LIST OF FORMULAS
DJJ2093 - FLUID MECHANICS

FLUID PROPERTIES

$$S = \frac{\omega_{substance}}{\omega_{water}}$$

FLUID STATICS

$$F_b = \rho g V$$

FLUID DYNAMICS

$$z_1 + \frac{P_1}{\omega} + \frac{v_1^2}{2g} = z_2 + \frac{P_2}{\omega} + \frac{v_2^2}{2g}$$

$$Q_{Actual} = C_d\left(Q_{Thoery}\right)$$

$$Q_{Thoery} = A_1\sqrt{\frac{2gH}{(m^2 - 1)}}$$

$$H = \frac{P_1 - P_2}{\omega_{sub}} + (z_1 - z_2) = x\left[\frac{\omega_{Hg}}{\omega_{sub}} - 1\right]$$

ENERGY LOSSES IN PIPELINE

$$h_L = \frac{(v_1 - v_2)^2}{2g}$$

$$h_c = \left[\frac{1}{c_c} - 1\right]^2 x\frac{v^2}{2g}$$

$$h_f = \frac{4fL}{d}\frac{v^2}{2g}$$

$$h_i = \frac{1}{2}\left[\frac{v^2}{2g}\right]$$

$$h_o = \frac{v^2}{2g}$$