INSTRUCTION:
This section consists of **FOUR (4)** structure questions. Answer **ALL** questions.

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

QUESTION 1
SOALAN 1

CLO1
C1

(a) Define Pascal's Law and write the equation for hydraulic system.
Berikan definisi Hukum Pascal serta tuliskan persamaan hukum tersebut.

[5 marks]
[5 markah]

CLO1
C2

(b) A force, F 550N is applied to a small cylinder of a hydraulic jack that contains water. The diameter of a small piston is 2.5 m and the area of a larger piston is 25 m². Calculate the load that can be lifted on the larger piston if the piston is at the same level.
Daya, F 550N dikenakan keatas silinder kecil hidraulik jek yang mengandungi air. Diameter omboh kecil adalah 2.5 m dan luas omboh yang lebih besar adalah 25 m². Kirakan beban yang boleh diangkat pada omboh yang lebih besar jika omboh berada pada aras yang sama.

[5 marks]
[5 markah]

CLO1
C3

(c) A U tube manometer as shown in Diagram 1(c) contains fluid P, fluid Q and water. With the heights given, calculate the pressure difference between pipe A and B.
Sebuah manometer tiub U seperti dalam Rajah 1(c) mengandungi cecair P, cecair Q dan air. Dengan ketinggian yang diberikan, kirakan perbezaan tekanan di antara paip A dan B.

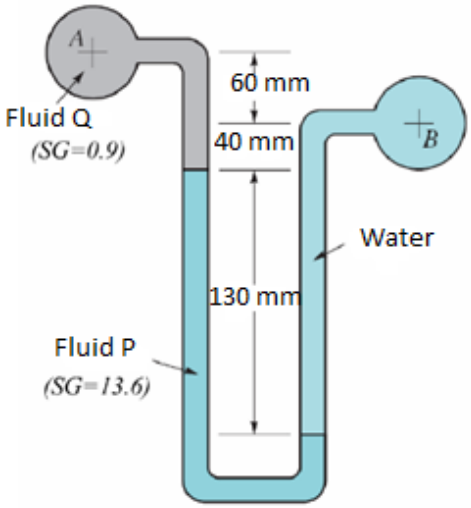

Diagram 1(c)/Rajah 1 (c)

[15 marks]
[15 markah]

QUESTION 2
SOALAN 2

CLO1
C1

(a) Define Laminar flow and by using the Reynolds number, state **THREE (3)** types of the flow.

Berikan definisi aliran laminar dan dengan merujuk kepada number Reynolds, nyatakan ***TIGA (3)*** *jenis aliran.*

[5 marks]
[5 markah]

CLO1
C2

(b) A pipe as shown in Diagram 2 (b) has a diameter of 15 cm and 30 cm at the cross-section 1 and 2 respectively. Water flow at section 1 is 3.5m/s. Calculate;

Sebatang paip mempunyai diameter masing-masing 15 cm dan 30 cm pada keratan rentas 1 dan 2 seperti dalam Rajah 2 (b). Halaju air di bahagian 1 diberikan 3.5m/s. Kirakan;

i. Velocity at section 2
Halaju pada seksyen 2

[3 marks]
[3 markah]

ii. Flow rate at section 1
Kadar alir pada seksyen 1

[2 marks]
[2 markah]

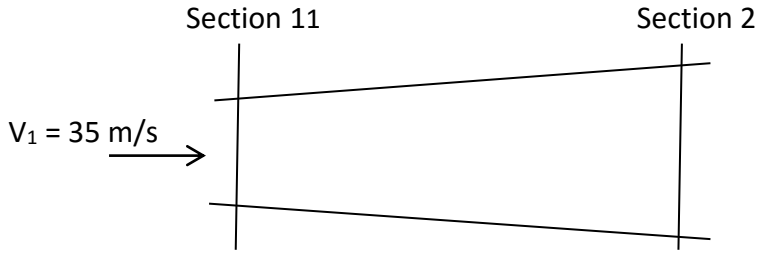

Diagram 2(b)/Rajah 2(b)

CLO1 C3

(c) A meter orifice with diameter 10 cm is inserted in a pipe of 20 cm diameter. Coefficient of discharge, C_d = 0.6 and specific gravity of oil in the pipe is 0.9. The pressure difference that is measured by the manometer is 700 cm. Calculate the flow rate of the oil through the pipe.

Satu orifis meter dengan diameter 10 cm dimasukkan ke dalam sebatang paip berdiamter 20 cm. Pekali pelesan untuk meter adalah 0.6 dan spesifik graviti minyak di dalam paip ialah 0.9. Perbezaan tekanan yang diukur oleh manometer ialah 700cm. Kirakan kadar aliran minyak melalui paip tersebut.

[15 marks]
[15 markah]

QUESTION 3
SOALAN 3

CLO2 C1

(a) List down **TWO (2) types** of pipeline problem with a proper diagram.
*Senaraikan **DUA (2)** jenis permasalahan laluan paip dengan rajah yang betul.*

[5 marks]
[5 markah]

CLO2 C2

(b) An oil flows through a pipe with the diameter of 58 mm at velocity of 3.65 m/s. Pipes decreased by 50% from the original diameter. If given C_c=0.62, determine the energy losses due to the sudden contraction.

Minyak mengalir melalui paip berdiameter 58 mm dengan halaju 3.65 m/s. Paip mengecil sebanyak 50% daripada diameter asal. Jika diberi C_c=0.62, tentukan kehilangan turus disebabkan oleh pengecilan mendadak.

[5 marks]
[5 markah]

CLO2
C3

(c) Water flows through a 750 mm diameter cast iron pipe with length of 2000 m from reservoir A to reservoir B. The inlet and outlet of the pipe are sharp. If the level difference between both reservoir is 10 m, calculate the flow rate of water through the pipe if the coefficient of friction is 0.01.

Air mengalir melalui sebatang paip keluli yang berdiameter 750mm dengan panjangnya 2000 m dari tangki A ke tangki B. Bahagian masukan dan keluaran adalah tajam. Jika perbezaan aras di antara kedua tangki adalah 10 m, kirakan kadaralir paip jika pekali geseran 0.01.

[15 marks]
[15 markah]

QUESTION 4
SOALAN 4

CLO2
C1

(a) Show whether the equation Torque = force x length is homogeneous
Tunjukkan sama ada persamaan Tork = daya x panjang adalah homogen

[5 marks]
[5 markah]

CLO2
C2

(b) A jet of water flow out of a nozzle heading to the positive x-direction and strikes a flat plate at a 90°angle. If the nozzle has a 20 cm diameter and the flow has a 3.44 m/s velocity, calculate the force exerted on the plate by the water.

Air mengalir keluar dari muncung paip pada arah x dan mengenai plat rata pada Sudut 90^0. Jika muncung tersebut mempunyai diameter 20cm dan aliran mempunyai halaju 3.44 m/s, kirakan daya dikenakan pada plat yang disebabkan oleh air.

[8 marks]
[8 markah]

CLO2
C3

(c) 300 liter/s of water is flowing in a pipe with a diameter of 315mm. If the pipe is bent to 45°, calculate the magnitude and direction of the resultant force on the bend. Given the pressure of water flowing is 40 N/cm^2.

Sejumlah 300 liter/s air mengalir di dalam paip yang mempunyai diameter 315mm. Jika paip dibengkokkan pada sudut 45^o, kirakan magnitud dan arah daya paduan pada sudut bengkok tersebut. Diberikan tekanan air yang mengalir adalah 40 N/cm^2.

[12 marks]
[12 markah]

SOALAN TAMAT

LIST OF FORMULA

DGP2053 FLUID MECHANICS

FLUID DYNAMICS

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

$$Q_{actual}=C_d\times A_1\sqrt{\frac{2gH}{\left(m^2-1\right)}}$$

$$Q_{actual}=\frac{C_d\times A_1}{\sqrt{(m^2-1)}}\sqrt{2g\left[\frac{P_1-P_2}{\omega}+(z_1-z_2)\right]}$$

$$H=\frac{P_1-P_2}{\omega_{Sub}}=x\left[\frac{\omega_{Hg}}{\omega_{Sub}}-1\right]$$

PIPE SYSTEMS

$$h_C=\left[\frac{1}{Cc}-1\right]^2\times\frac{v_2^2}{2g}$$

$$h_i=0.5\frac{v_1^2}{2g}$$

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

$$h_L=\frac{\left(V_1-V_2\right)^2}{2g}$$

$$h_o=\frac{V_2{}^2}{2g}$$

MOMENTUM EQUATION

Total Force

$F_x=\dot{m}(u_2cos\theta_2-u_1cos\theta_1)$

$F_y=\dot{m}(u_2sin\theta_2-u_1sin\theta_1)$

Resultant Force

$F_R=\sqrt{F_x^2+F_y^2}$

$\theta=\tan^{-1}\left(\frac{F_y}{F_x}\right)$

Pressure Force

$F_{Px}=P_1A_1cos\theta_1-P_2A_2cos\theta_2$

$F_{Py}=P_1A_1sin\theta_1-P_2A_2sin\theta_2$