SULIT

KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN MEKANIKAL

PEPERIKSAAN AKHIR

SESI II : 2022/2023

DJJ20073: FLUID MECHANICS

TARIKH : 21 JUN 2023
MASA : 8.30 PG – 10.30 PG (2 JAM)

Kertas ini mengandungi **SEPULUH (10)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

INSTRUCTION:

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 (a) Define the following terms:

Takrifkan terma-terma berikut.

i. Fluid

Bendalir

[2 marks]

[2 *markah*]

ii. Liquid

Cecair

[2 marks]

[2 *markah*]

CLO1 (b) Compare the differences between gases and liquid.

Bandingkan perbezaan antara gas dan cecair.

[6 marks]

[*6 markah*]

CLO2 (c) Explain **THREE (3)** of the physical properties of fluid.

*Terangkan **TIGA (3)** sifat fizik bendalir.*

[6 marks]

[6 *markah*]

CLO2

(d) A beaker contains some fluid has a specific weight of $45kNm^{-3}$ and volume of $250cm^3$. Calculate:

Sebuah bikar mengandungi cecair yang mempunyai berat tentu $45kNm^{-3}$ *dan isipadu* $250cm^3$. *Kirakan:*

i. Mass Density
Ketumpatan

[3 marks]
[3 *markah*]

ii. Mass of fluid
Jisim bendalir

[3 marks]
[3 *markah*]

iii. Specific Volume
Isipadu Tentu

[3 marks]
[3 *markah*]

QUESTION 2

SOALAN 2

CLO2 (a) Define the Pascal's Law using an appropriate diagram.
Takrifkan Hukum Pascal menggunakan rajah yang sesuai.

[4 marks]
[4 *markah*]

CLO2 (b) The diameter of small piston and large piston are $50mm$ and $300mm$ respectively. The weight lifted by the larger piston is $14.835kN$ and given mass density of fluid is $1065kgm^{-3}$. Express the value of the force applied at the small piston if:
Diameter omboh kecil dan omboh besar adalah masing-masing $50mm$ *dan* $300mm$. *Beban yang boleh diangkat pada omboh besar ialah* $14.835kN$ *dan ketumpatan bendalir adalah* $1065kgm^{-3}$. *Nyatakan nilai daya yang dikenakan pada omboh kecil jika:*

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

[4 marks]
[*4 markah*]

ii. The large piston is 0.5m below the small piston.
Omboh besar berada 0.5m di bawah omboh kecil.

[3 marks]
[3 *markah*]

iii. The large piston is 0.5m above the small piston.
Omboh besar berada 0.5m di atas ombih kecil.

[3 marks]
[*3 markah*]

CLO2

(c) A U-tube differential manometer as shown in **Figure 2(c)** which contains mercury of specific gravity 13.6 is connected to different pipes at A and B. Pipe A contains of oil with specific gravity 0.92 and pipe B is carrying water. If the pressure at point A is $125kNm^{-2}$, calculate the pressure at point B.

Manometer kebezaan seperti ***Rajah 2(c)*** *mengandungi merkuri dengan graviti tentu* 13.6 *disambungkan pada dua paip berbeza iaitu paip A dan B. Paip A mengandungi minyak dengan graviti tentu* 0.92 *dan paip B mengandungi air. Jika tekanan pada paip A adalah* $125kNm^{-2}$*, kirakan tekanan pada paip B.*

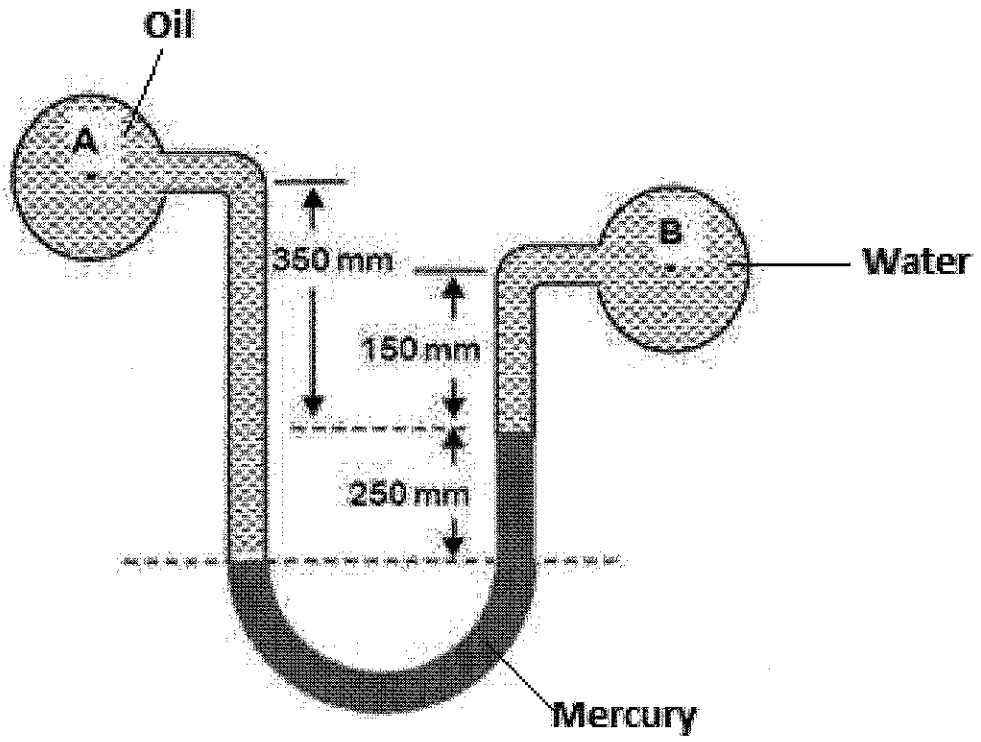


Figure 2(c) / Rajah 2(c)

[11 marks]

[11 *markah*]

QUESTION 3

SOALAN 3

CLO2 a) List and sketch **Four (4)** types of flow.

*Senaraikan dan lakarkan **Empat (4)** jenis aliran.*

[6 marks]

[*6 markah*]

CLO2 b) Explain the principle of continuity equation for pipe below by using diagram and equation:

Terangkan prinsip persamaan keterusan bagi paip di bawah menggunakan rajah dan persamaan:

i. Single pipe with same diameter

Paip tunggal sama diameter

[2 marks]

[*2 markah*]

ii. Single pipe with difference diameter

Paip tunggal berlainan diameter

[2 marks]

[*2 markah*]

iii. Single pipe on a diffuser

Paip tunggal pada penyembar.

[2 marks]

[*2 markah*]

iv. Branch pipe

Paip bercabang

[3 marks]

[*3 markah*]

CLO2

c) A vertical venturi meter measures the flow of oil of specific gravity 0.82 and has an entrance of 135 mm diameter and throat of 55 mm diameter. There are pressure gauges at the entrances and at the throat, which is 350 mm above the entrance. If the coefficient for the meter is 0.96 and pressure difference is 28.5 kN/m^2, calculate the actual discharge in m^3/s.

Meter venturi menegak mengukur aliran minyak dengan graviti tentu 0.82 dan mempunyai diameter masukan 135 mm dan diameter kerongkong 55 mm. Terdapat tolok tekanan di bahagian masukan dan di kerongkong, iaitu 350 mm di atas pintu masuk. Jika pekali untuk meter ialah 0.96 dan perbezaan tekanan ialah 28.5 kN/m^2, hitung kadar alir sebenar dalam m^3/s.

[10 marks]

[*10 markah*]

QUESTION 4

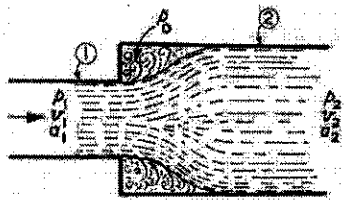
SOALAN 4

CLO2

a) Based on the picture below, state the types of losses and the suitable formula:

Berdasarkan gambarajah di bawah, nyatakan jenis kehilangan yang berlaku dan formula yang sesuai:

i.



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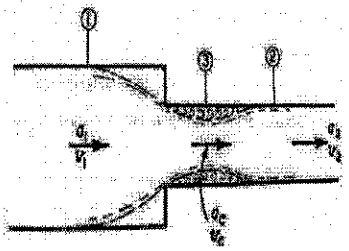

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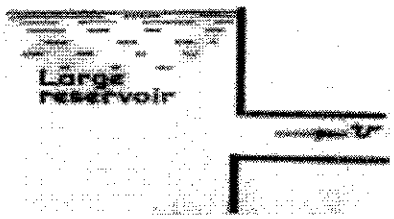

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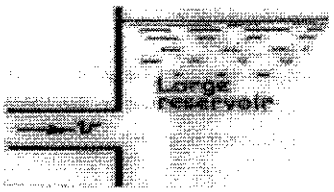

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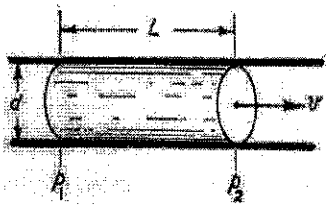

[5 marks]

[*5 markah*]

CLO2

b) A horizontal pipe carrying 1900 l/min of water increases suddenly from 12 cm to 20 cm diameter. Express the value of head loss due to the diameter changing and the difference in pressure in kN/m^2 in the two pipes. The head loss due to friction is negligible.

Paip mendatar yang membawa 1900 l/min air membesar secara tiba-tiba daripada diameter 12 cm kepada 20 cm. Nyatakan nilai kehilangan turus akibat perubahan diameter dan perbezaan tekanan dalam kN/m^2 dalam kedua-dua paip. Kehilangan turus akibat geseran boleh diabaikan.

[8 marks]

[*8 markah*]

CLO2

c) Referring to **Figure 4(c)**, two large reservoirs was connected by three pipes with the following measurement: $L_1 = 30$ m, $L_2 = 15$ m, $L_3 = 28$ m, $d_1 = 150$ mm, $d_2 = 100$ mm and $d_3 = 150$ mm. The entry and exit sections are sharp and suddenly changed. Tank B is 6 m below tank A. The coefficient of friction is 0.01 for all three pipes and coefficient of contraction, C_c is 0.6. Calculate the flow rate, Q.

*Merujuk **Rajah 4(c)**, dua tangki besar telah dihubungkan menggunakan tiga batang paip dengan ukuran berikut: $L_1 = 30$ m, $L_2 = 15$ m, $L_3 = 28$ m, $d_1 = 150$ mm, $d_2 = 100$ mm dan $d_3 = 150$ mm. Bahagian masuk dan keluar adalah tajam dan berubah secara mendadak. Tangki B berada 6m di bawah tangki A. Pekali geseran, f adalah 0.01 untuk ketiga-tiga paip dan pekali penguncupan, Cc adalah 0.6. Kirakan kadaralir, Q*

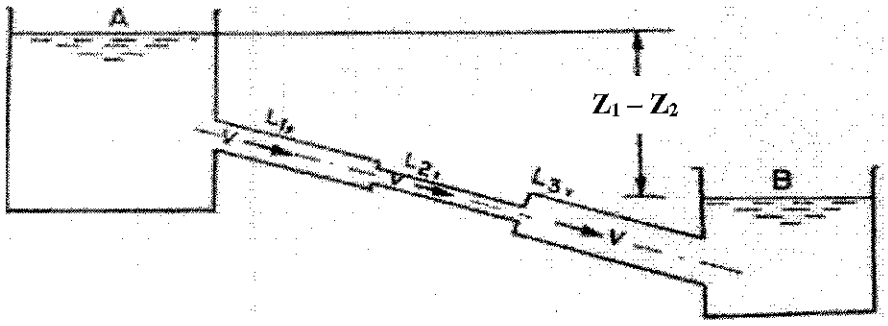

Figure 4(c)/*Rajah 4(c)*

[12 marks]

[*12 markah*]

SOALAN TAMAT

LIST OF FORMULA
DJJ20073 FLUID MECHANICS

FLUID PROPERTIES	FLUID STATIC
$S_{substance} = \frac{\omega_{substance}}{\omega_{water}}$	$F_b = \rho g V$
FLUID DYNAMICS	**ENERGY LOSS IN PIPELINE**
$Z_1 + \frac{P_1}{\omega} + \frac{V_1^2}{2g} = Z_2 + \frac{P_2}{\omega} + \frac{V_2^2}{2g}$	$h_L = \frac{(v_1 - v_2)^2}{2g}$
$Q_{actual} = Q_1 C_d$	$h_O = \frac{v^2}{2g}$
$Q_1 = A_1 \sqrt{\frac{2gH}{m^2 - 1}}$	$h_i = \frac{1}{2}\left[\frac{v^2}{2g}\right]$
$H = x\left(\frac{S_{Hg}}{S_{sub}} - 1\right)$	$h_c = \left[\frac{1}{C_c} - 1\right]^2 \left[\frac{v^2}{2g}\right]$
	$h_f = \frac{4fL}{d}\frac{v^2}{2g}$