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

JABATAN KEJURUTERAAN MEKANIKAL

PEPERIKSAAN AKHIR

SESI I : 2022 / 2023

DJJ20073: FLUID MECHANICS

TARIKH : 14 DISEMBER 2022
MASA   : 08.30 AM – 10.30 AM (2 JAM)

Kertas ini mengandungi **SEMBILAN (9)** 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)** structured questions. Answer **ALL** questions.

ARAHAN:

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

QUESTION 1

SOALAN 1

CLO1
C1

(a) State **FOUR (4)** types of pressure.

*Nyatakan **EMPAT (4)** jenis tekanan.*

[4 marks]

[*4 markah*]

CLO1
C2

(b) Figure 1(b) below shows a beaker contains water with 3 holes at point A, B and C.

Rajah 1(b) di bawah menunjukkan sebuah bikar yang mengandungi air dengan 3 lubang pada titik A, B dan C.
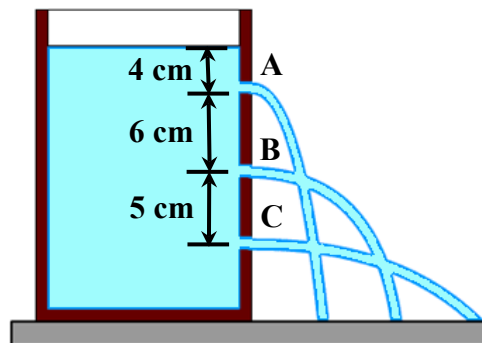

Figure 1(b) / *Rajah 1(b)*

    i. Express the value of pressure at point A and C.

       Nyatakan nilai tekanan di titik A dan C.

[5 marks]

[*5 markah*]

    ii. Based on question (i), explain the relationship between pressure and depth.

       Berdasarkan soalan (i), terangkan hubungan diantara tekanan dan kedalaman.

[1 mark]

[*1 markah*]

CLO2
C2

(c) Explain the types of properties of fluid complete with the formula for:

Terangkan jenis-jenis sifat bendalir lengkap bersama formula bagi:

   i. Mass density.

    Ketumpatan jisim.

[2 marks]

[*2 markah*]

   ii. Specific weight.

    Berat tentu.

[2 marks]

[*2 markah*]

   iii. Specific volume.

    Isipadu tentu.

[2 marks]

[*2 markah*]

CLO2
C3

(d) A solid round metal with mass of 1500 gram has diameter of 0.45m and thickness of 5cm. Calculate:

Logam pepejal bulat berjisim 1500 gram mempunyai diameter 0.45m dan ketebalan 5cm. Kirakan:

   i. The density of the metal.

    Ketumpatan logam.

[6 marks]

[*6 markah*]

   ii. The specific volume of the metal.

    Isipadu tentu logam.

[3 marks]

[*3 markah*]

QUESTION 2
SOALAN 2

CLO2
C1

(a) State **FOUR (4)** types of manometers.

*Nyatakan **EMPAT (4)** jenis manometer.*

[4 marks]

[*4 markah*]

CLO2
C2

(b) A hydraulic jack lifts a load of 16.3 kN with the force of 1320 N applied to the small cylinder as shown in Figure 2(b). The area of large cylinder is 91 cm^2.
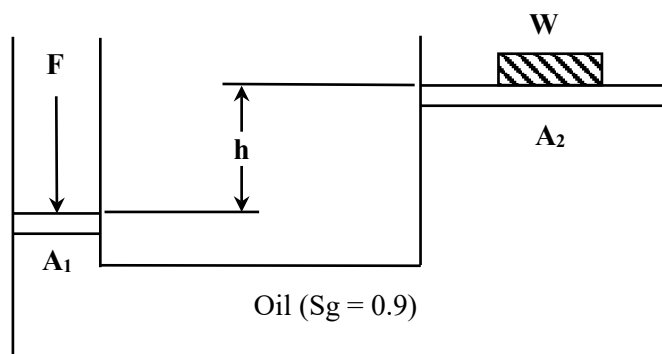
Sebuah jek hidraulik mengangkat beban 16.3 kN dengan daya 1320 N dikenakan pada silinder kecil seperti yang ditunjukkan dalam Rajah 2(b). Luas silinder besar ialah 91 cm^2.

Figure 2(b) / *Rajah 2(b)*

i. Express the mass density of oil.

Nyatakan ketumpatan jisim minyak.

[3 marks]

[*3 markah*]

ii. Express the diameter of small cylinder if the small cylinder is 0.7 m below the large cylinder.

Nyatakan diameter silinder kecil jika silinder kecil adalah 0.7 m di bawah silinder besar.

[7 marks]

[*7 markah*]

4

CLO2
C3

(c) The Figure 2(c) below is used to measure difference in pressure between two pipes. Given the relative density of oil and mercury which are 0.83 and 13.6 respectively, pressure difference is 1.54 kN/m², h_1 = 40 cm and h_2 = 73 cm. Calculate:

Rajah 2(c) di bawah digunakan untuk mengukur tekanan perbezaan antara dua paip. Diberi ketumpatan relatif minyak dan merkuri ialah 0.83 dan 13.6, perbezaan tekanan ialah 1.54 kN/m², h_1 = 40 cm dan h_2 = 73 cm. Kirakan:
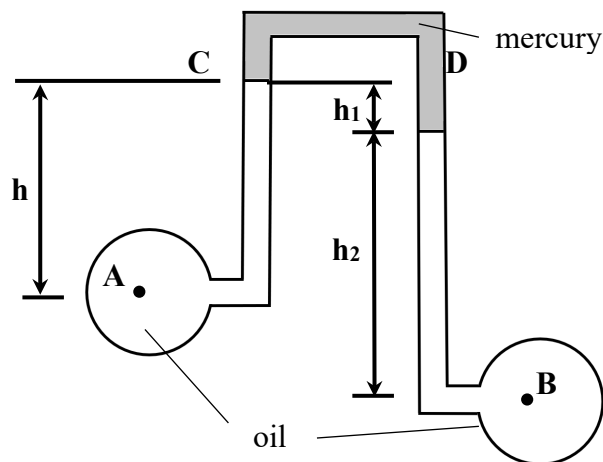

Figure 2(c) / Rajah 2(c)

i. The specific weight of oil and mercury.

Berat tentu bagi minyak dan merkuri.

[4 marks]
[*4 markah*]

ii. The height of h.

Ketinggian bagi h.

[7 marks]
[*7 markah*]

QUESTION 3

SOALAN 3

CLO2
C1

(a) By using a diagram, describe the types of flow below:

Dengan menggunakan gambarajah, terangkan jenis-jenis aliran di bawah:

    i.   Uniform flow

        Aliran Seragam

[3 marks]

[*3 markah*]

    ii.   Laminar flow

        Aliran Laminar
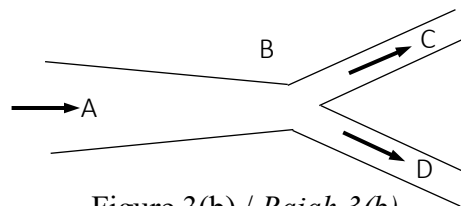
[3 marks]

[*3 markah*]

CLO2
C2

(b) A pipe AB with diameter of 0.55 m at A and 0.41 m at B, branches into two pipes C and D as shown in Figure 3(b). The area of pipe C is 0.045 m^2 with velocity of 4 m/s and area of pipe D is 0.038 m^2. Express the value of:

Sebatang paip AB dengan diameter 0.55 m di A dan 0.41 m di B, bercabang menjadi dua paip C dan D seperti ditunjukkan dalam Rajah 3(b). Luas paip C adalah 0.045 m^2 dengan halaju 4 m/s dan luas paip D adalah 0.038 m^2. Nyatakan nilai bagi:

Figure 3(b) / *Rajah 3(b)*

    i. The flow rate on pipe A if the velocity is 2.5 m/s.

      Kadar alir pada paip A jika halaju adalah 2.5 m/s.

[4 marks]

[4 *markah*]

    ii. The velocity at pipe D.

      Halaju pada paip D.

[5 marks]

[5 *markah*]

CLO2
C3

(c) An inclined Venturi meter measures the flow of oil (S = 0.9) has an entrance area of 0.212 m^2 and the area ratio is 4. There are pressure gauges at the entrance and at the throat, which at the throat is 515 mm above the entrance. If the coefficient of discharge is 0.9 and the pressure difference is 1.43 bar, calculate;

Meter Venturi condong yang mengukur aliran minyak (S = 0.9) mempunyai luas masukan 0.212 m^2 dan nisbah luas adalah 4. Terdapat tolok tekanan di bahagian masuk dan di leher, di mana leher adalah 515 mm di atas bahagian masuk. Jika pekali kecekapan adalah 0.9 dan perbezaan tekanan ialah 1.43 bar, kirakan;

i. The pressure head of liquid (H).

   Tekanan dalam sebutan (H).

[5 marks]

[5 markah]

ii. The actual discharge.

   Kadar alir sebenar.

[5 marks]

[5 markah]

QUESTION 4

SOALAN 4

CLO2
C1

(a) List **FIVE (5)** types of energy loss in pipe system.

*Senaraikan **LIMA (5)** jenis kehilangan tenaga dalam sistem paip.*

[5 marks]

[*5 markah*]

CLO2
C2

(b) Water flows from an incline pipeline with a rate of 0.065 m³/s from a pipe of 150 mm in a diameter to the pipe 75 mm in diameter. The exit of the pipe is located 5 m below the entrance. Given Cc = 0.63, express the value of:

Air dialirkan dari sebatang paip condong dengan kadar 0.065 m³/s dari diameter 150 mm ke paip berdiameter 75 mm. Bahagian keluar paip adalah terletak 5m di bawah bahagian masuk. Diberi Cc = 0.63, nyatakan nilai bagi;

i. The loss of head due to sudden contraction.

Kehilangan tenaga disebabkan pengecilan paip secara mendadak.

[6 marks]

[*6 markah*]

ii. The pressure difference between the two pipes.

Perbezaan tekanan di antara dua paip.

[2 marks]

[*2 markah*]

CLO2
C3

(c) Two tanks filled with water is connected by serial pipe A and B. Pipe A has a diameter of 0.1 m with length of 155 m, while pipe B has a diameter of 0.5 m with length of 115 m. The velocity of water entering the pipe is 0.891 m/s. Given f = 0.01 for all pipes. If the energy losses is because of the **sudden enlargement and frictions only**, calculate;

Dua tangki berisi air disambungkan dengan paip bersiri A dan B. Paip A mempunyai diameter 0.1 m dengan panjang 155 m, manakala paip B mempunyai diameter 0.5 m dengan panjang 115 m. Halaju air yang memasuki paip adalah 0.891 m/s. Diberi

*f = 0.01 bagi semua paip. Jika tenaga hilang kerana **pembesaran mendadak dan geseran sahaja**, kirakan;*

i. The exit velocity of water.

    Halaju air bahagian keluar.

[4 marks]

[*4 markah*]

ii. The level difference of the two tanks.

    Perbezaan aras di antara kedua-dua tangki.

[8 marks]

[*8 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**
$$Z_1 + \frac{P_1}{\omega} + \frac{V_1^2}{2g} = Z_2 + \frac{P_2}{\omega} + \frac{V_2^2}{2g}$$ $$Q_{actual} = Q_1 C_d$$ $$Q_1 = A_1 \sqrt{\frac{2gH}{m^2 - 1}}$$ $$H = \frac{S_{sub}}{S_{oil}} - 1$$	$$h_L = \frac{(v_1 - v_2)^2}{2g}$$ $$h_L = \frac{v^2}{2g}$$ $$h_c = \frac{1}{2}\left[\frac{v^2}{2g}\right]$$ $$h_c = \left[\frac{1}{C_c} - 1\right]^2 \left[\frac{v^2}{2g}\right]$$ $$h_f = \frac{4fLv^2}{D.2g}$$

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