SULIT

POLITEKNIK MALAYSIA

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

JABATAN KEJURUTERAAN PETROKIMIA

PEPERIKSAAN AKHIR

SESI II : 2021 / 2022

DGP20082 : FLUID MECHANICS

TARIKH : 7 JULAI 2022
MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas ini mengandungi **ENAM (6)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

INSTRUCTION:

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

ARAHAN:

Bahagian ini mengandungi EMPAT (4) soalan berstruktur. Jawab SEMUA soalan.

QUESTION 1

SOALAN 1

CLO1
C1

a) Define fluid and give **TWO (2)** types of fluid

Takrifkan bendalir dan berikan DUA (2) jenis bendalir

[3 Marks]

[3 *Markah*]

CLO1
C2

b) Given the temperature of the fluid in a boiler is 786 ^{0}C. Convert the temperature of the fluid to Fahrenheit, Kelvin and Rankine scales.

Diberi suhu bendalir di dalam dandang adalah 786 ^{0}C. Tukarkan suhu bendalir tersebut kepada skala Fahrenheit, Kelvin dan Rankine

[10 Marks]

[*10 Markah*]

CLO1
C3

c) A liquid when poured into a cylinder is found to weigh 8N when occupying a volume of 500 ml. Calculate its specific weight, density and specific gravity

Didapati berat suatu cecair apabila dituang ke dalam silinder adalah 8 N dan boleh memenuhi ruang isipadu sebanyak 500 ml. Kirakan berat spesifik, ketumpatan dan graviti tentu untuk cecair tersebut.

[12 Marks]

[*12 Markah*]

QUESTION 2

SOALAN 2

CLO1 C1

a) State Pascal's Law and give **ONE (1)** example of application in Pascal's Law.
Nyatakan Hukum Pascal dan beri SATU (1) contoh aplikasi Hukum Pascal

[3 Marks]
[*3 Markah*]

CLO1 C2

b) A force, F of 650N is applied to a small piston of a hydraulic jack as shown in Figure 2 (b) below. The diameter of the small piston is 25 cm and diameter of the large piston is 80cm respectively. Locate the load that can be lifted if large piston is located same level with the small piston. Water is used as a medium of fluid for the hydraulic jack.

Satu daya sebanyak 650N dikenakan ke atas omboh kecil seperti yang ditunjukkan dalam rajah 2 (b) di bawah. Diameter untuk piston yang kecil ialah 25cm dan diameter untuk piston besar ialah 80 cm. Cari beban yang boleh diangkat jika omboh besar berada saru paras dengan omboh kecil. Air digunakan sebagai medium bendalir untuk jek hidraulik

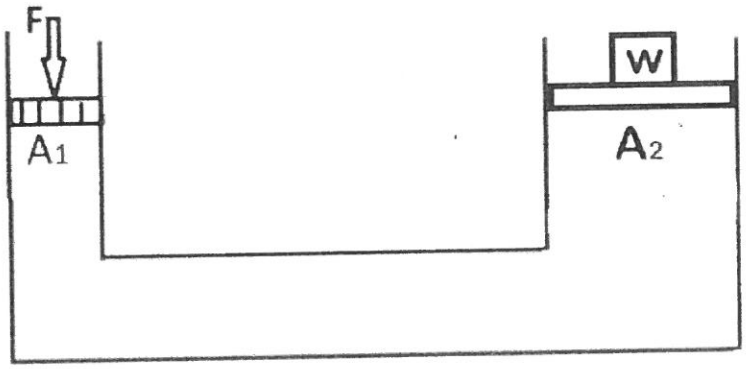

Figure 2 (b)
Rajah 2 (b)

[10 Marks]
[*10 Markah*]

CLO1
C3

c) The difference of pressure between points A and B in a liquid is measured using a U Tube manometer as shown in Figure 2(c). The U tube contains mercury and liquid A and B is oil. Calculate the difference in pressure if h =1.25m, h_1 = 0.6m and h_2 = 0.45m. Given specific gravity of the oil, S_{oil} is 0.85 and the specific gravity of mercury is 13.6

Perbezaan tekanan di antara titik A dan B di dalam bendalir diukur dengan menggunakan tiub U manometer seperti yang ditunjukkan pada Rajah 2(c) di bawah. Tiub U tersebut mengandungi bendalir merkuri manakala bendalir A dan B adalah minyak. Kirakan perbezaan tekanan jika h =1.25m, h_1 = 0.6m dan h_2 = 0.45m. Diberi graviti tentu bagi minyak dan adalah 0.85 dan merkuri ialah ialah 13.6.

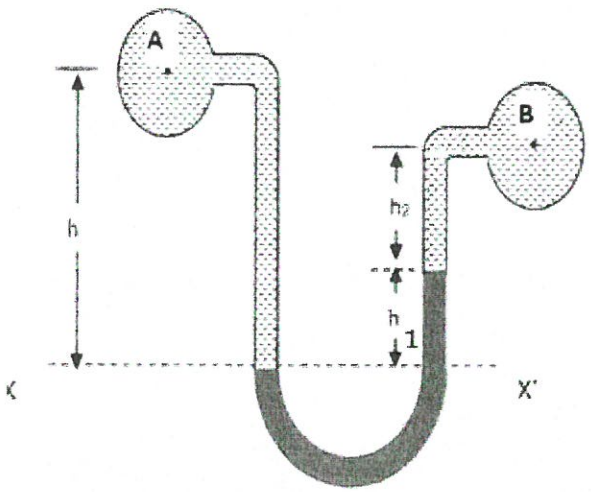

Figure 2 (c)

Rajah 2 (c)

[12 Marks]

[*12 Markah*]

QUESTION 3

SOALAN 3

CLO2
C1

a) Define volume flow rate and mass flow rate. Then give their equations and SI unit respectively

Takrifkan kadar alir isipadu dan kadar alir jisim. Kemudian berikan persamaan dan unit SI masing masing.

[4 Marks]

[*4 Markah*]

CLO2
C2

b) Water flows in a horizontal pipe with a dimeter of 30mm with a velocity 5 m/s. Express the volume flow rate and mass flow rate

Air mengalir di dalam paip mendatar yang mempunyai diameter 30 mm dan berhalaju 5 m/s. Nyatakan kadar alir isipadu dan kadar alir jisim

[8 Marks]

[*8 Markah*]

CLO2
C3

c) A venturi tube tapers from 300 *mm* in diameter at the entrance to 100 *mm* in diameter at the throat; the discharge coefficient is 0.98. A differential mercury U-tube gauge is connected between pressure tapping at the entrance of the throat.If the meter is used to measure the flow of water and the water fills the leads to the U-tube which is in contact with mercury, calculate the discharge when the difference of level in U-tube is 55 mm.

Sebuah tiub venturi mengecil daripada diameter 300 mm dibahagian masukan kepada bahagian leher yang berdiameter 100 mm . Pekali kadar alir ialah 0.98.Perbezaan Tolok tiub U merkuri disambungkan antara ketukan tekanan di pintu masuk leher. Jika meter ini digunakan untuk menyukat kadar alir air dan air itu bergerak ke tiub-U yang bersentuhan dengan merkuri, kirakan kadar alir apabila perbezaan aras dalam tiub-U ialah 55 mm.

[13 Marks]

[*13 Markah*]

QUESTION 4

SOALAN 4

CLO2 C1

a) State **FIVE (5)** types of loss in a pipe line.

*Nyatakan **LIMA (5)** jenis kehilangan dalam talian paip.*

[5 Marks]

[*5 Markah*]

CLO2 C2

b) A pipe carrying 1800 *l*/min of water increases suddenly from 10 *cm* to 15 *cm* diameter. Express the head loss due to sudden enlargement

Satu paip yang mengandungi 1800 l/min air berubah diameter secara mendadak daripada 10cm kepada 15cm. Nyatakan kehilangan kepala turus disebabkan perubahan secara mendadak.

[8 Marks]

[*8Markah*]

CLO2 C3

c) Water is discharged into the atmosphere from a reservoir through a 75m long pipe which flows at 0.055m^3/s. The entrance to the pipe is sharp and the pipe diameter is 350mm for the first 30m. The remaind of the pipe length contracts to 200mm in diameter. Given f= 0.004 for the small pipe and f=0.003 for the bigger pipe. Assume C_c=0.65. Calculate the head loss that occurs in the pipe and the level difference between the surface of the reservoir and the pipe outlet.

Air dilepaskan ke atmosfera dari takungan melalui paip 75m panjang yang mengalir pada 0.055m^3/s. Permulaan air masuk adalah tajam dan berdiameter paip adalah 350mm bagi 30m pertama. Baki panjang paip mengecil kepada diameter 200mm. Ambil nilai f= 0.004 untuk paip kecil dan f= 0.003 bagi paip yang lebih besar. Andaikan C_c=0.65. Kirakan kehilangan kepala turus di dalam paip dan perbezaan paras di antara permukaan takungan dan saluran paip keluar.

[12 Marks]

[*12 Markah*]

SOALAN TAMAT

LIST OF FORMULA

DGP20082 : FLUID MECHANICS

BASIC CONCEPTS OF FLUID MECHANICS

$$T(\,^oC) = T\,(K) - 273$$

$$T(R) = 1.8\,T\,(K)$$

$$T(F) = T\,(R) - 460$$

$$T(\,^oF) = 1.8T(\,^oC) + 32$$

$$\rho = \frac{mass,\, m}{volume, V}$$

$$\omega = \rho g$$

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

FLUID STATICS

$$P = \rho g h$$

$F_{buoyancy} = w = \rho g v = \rho g BLD$

FLUID DYNAMICS

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

$$Q_{Actual} = C_d \times A_1 \sqrt{\frac{2gH}{m^2 - 1}}$$

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

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

LOSSES IN PIPE SYSTEM

Losses due to sudden enlargement, $h_L = \frac{(V_1 - V_2)^2}{2G}$

$$Loss\ of\ sudden\ contraction, h_c = \left(\frac{1}{C_c} - 1\right)^2 \frac{v_2^2}{2g}$$

Loss at sharp inlet, h_i

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

Loss at sharp outlet, h_o

$$h_0 = \frac{v^2}{2g}$$

Loss of head due to friction, $h_f = \frac{4fL}{d}\frac{v^2}{2g}$