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POLITEKNIK
MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI DISEMBER 2014

CC303: HYDRAULICS 1

TARIKH   : 07 APRIL 2015
TEMPOH : 8.30AM – 10.30AM (2 JAM)

Kertas ini mengandungi **SEBELAS (11)** halaman bercetak.
Bahagian A: Soalan Pendek (10 soalan)
Bahagian B: Struktur (4 soalan)
Dokumen sokongan yang disertakan : **FORMULA**

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SECTION A : 40 MARKS
BAHAGIAN A : 40 MARKAH

INSTRUCTION:
This section consists of **TEN (10)** short questions. Answer ALL questions.

ARAHAN :
*Bahagian ini mengandungi **SEPULUH (10)** soalan pendek. Jawab semua soalan yang disediakan.*

CLO1
C1

QUESTION 1

List **TWO (2)** physical characteristics of liquid.

SOALAN 1

*Senaraikan **DUA (2)** ciri-ciri fizikal bagi cecair.*

[4 marks]
[*4 markah*]

CLO1
C2

QUESTION 2

A 2000g of liquid has a volume of 1300L. Determine the:

    i.   Weight, w

    ii.   Specific Weight, γ

SOALAN 2

2000g cecair mempunyai isipadu 1300L. Tentukan:

    i.   *Berat, w*

    ii.   *Berat Tentu, γ*

[4 marks]
[*4 markah*]

CLO1
C2

QUESTION 3

Calculate the pressure at the depth of 650 cm from the surface of a liquid which has a relative density of 0.8.

SOALAN 3

Kirakan tekanan pada kedalaman 650 cm dari permukaan sejenis cecair yang mempunyai ketumpatan bandingan 0.8.

[4 marks]
[*4 markah*]

CLO1
C3

QUESTION 4

Compute the gauge pressure and absolute pressure at a depth of 10 m below the water surface. Given $P_{atm} = 101$ kN/m².

SOALAN 4

Kira tekanan tolok dan tekanan mutlak pada kedalaman 10 m di bawah permukaan air. Diberi $P_{atm} = 101$ kN/m².

[4 marks]

[*4 markah*]

CLO1
C2

QUESTION 5
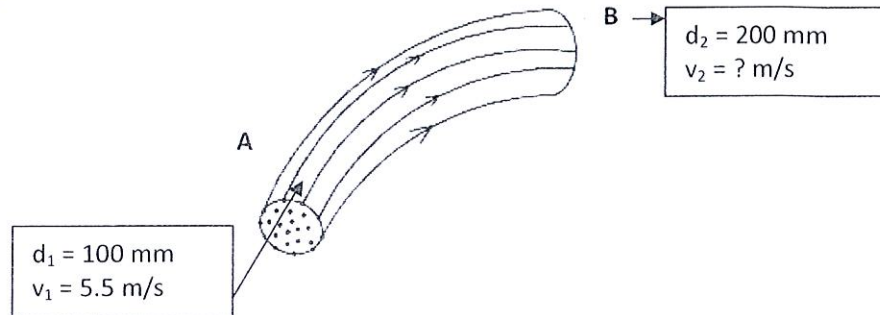

B → $d_2 = 200$ mm
$v_2 = ?$ m/s

A

$d_1 = 100$ mm
$v_1 = 5.5$ m/s

Figure A5 / *Rajah A5*

Water is flowing through pipe A to B. The diameter of pipe A and B are 100mm and 200mm. Calculate the velocity of water at B if the velocity given at A is 5.5 m/s.

SOALAN 5

Air mengalir melalui paip A ke B. Diameter paip A dan B masing-masing ialah 100mm dan 200mm. Tentukan halaju air di bahagian B, sekiranya halaju air di bahagian A ialah 5.5m/s.

[4 marks]

[*4 markah*]

CLO1
C3

QUESTION 6

Calculate the diameter of a pipe if it has to discharge oil at the rate, Q=2m³/s and the velocity,   V= 3m/s.

SOALAN 6

Kirakan diameter paip apabila paip tersebut mengalirkan minyak pada kadar Q=2m³/s dengan halaju V= 3m/s.

[4 marks]
[*4 markah*]

CLO1
C1

QUESTION 7

Identify **TWO (2)** characteristics of each flow :-

a.   Laminar flow

b.   Turbulent flow

SOALAN 7

Tentukan DUA (2) ciri aliran berikut :-

a.   Aliran Laminar

b.   Aliran Turbulen

[4 marks]
[*4 markah*]

CLO1
C2

QUESTION 8

Calculate the head loss due to friction in a 300 m length pipe and 15 cm diameter when the velocity of flow is 2.25m/s. Given f=0.01.

SOALAN 8

Kirakan nilai kehilangan turus disebabkan oleh geseran dalam paip 300m panjang dan 15cm diameter apabila halaju aliran adalah 2.25m/s. Ambil f=0.01.

[4 marks]
[*4 markah*]

CLO1
C2

QUESTION 9

Based on **Figure A9**, identify **FOUR (4)** points where minor loss of energy may occur.

SOALAN 9

*Berdasarkan **Rajah A9**, kenal pasti **EMPAT (4)** tempat yang boleh menyebabkan berlakunya kehilangan tenaga kecil.*
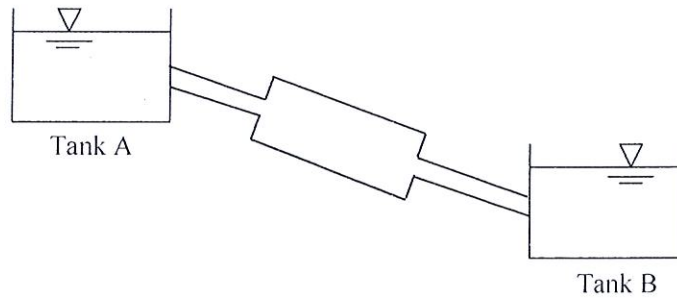
**Figure A9 / Rajah A9**

[4 marks]
[*4 markah*]

CLO1
C2

QUESTION 10

Refer to **Figure A10**. By using Chezy formula, calculate the discharge of water flowing through a rectangular channel. The bed slope of the channel is 1:2500. The given Chezy coefficient ,C=49.5

SOALAN 10

*Rujuk **Rajah A10**.Dengan menggunakan formula Chezy, kirakan kadar alir air yang mengalir melalui saluran terbuka tersebut. Diberi kecerunan dasar ialah 1:2500 dan pekali Chezy ,C = 49.5*
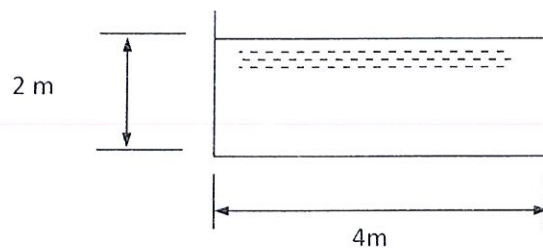
[4 marks]
[*4 markah*]

Figure A10 / Rajah A10

SECTION B : 60 MARKS

BAHAGIAN B : 60 MARKAH

INSTRUCTION:

This section consists of **FOUR (4)** structured questions. Answer **THREE (3)** questions only.

ARAHAN :

*Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **TIGA (3)** soalan sahaja.*

CLO1
C2

QUESTION 1

SOALAN 1

(a) Calculate:

(i) Gauge pressure

(ii) Absolute pressure

If the depth of water is 15 m below the water surface. Given $P_{atmosphere}$ = 200 kN/m².

(a) Kirakan:

(i) Tekanan tolok

(ii) Tekanan mutlak

Jika kedalaman di bawah permukaan air adalah 15 m. Diberi $P_{atmosfera}$= 200 kN/m².

[6 marks]

[6 markah]

CLO1
C3

(b) **Figure B1** shows a differential manometer. Pipe M and N contain oil with relative density of 0.85. If the pressure at pipe M and N are 40 kN/m², calculate the value of h. Given h_1= 1.2 m and h_2= 25 cm.

Rajah B1 menunjukkan satu manometer bezaan. Paip M dan N mengandungi minyak yang mempunyai ketumpatan bandingan 0.85. Jika perbezaan tekanan pada paip M dan N adalah 40 kN/m², kirakan nilai h. Diberi h_1= 1.2 m dan h_2= 25 cm.

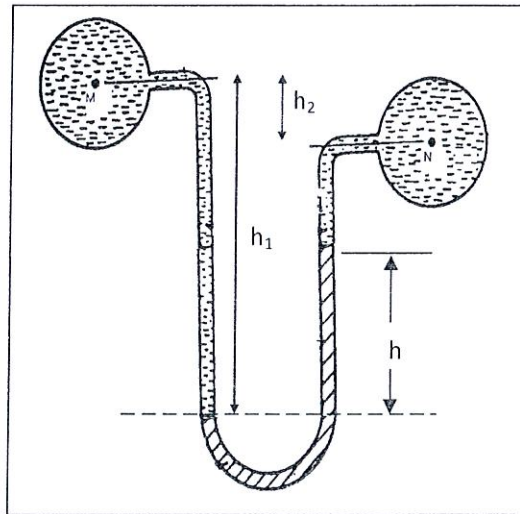**Figure B1 / *Rajah B1***

[14 marks]

[14 markah]

QUESTION 2

SOALAN 2

<div style="margin-left:0;">CLO1
C2</div>

(a)   Classify three (3) types of energy of a liquid and describe them.

Kelaskan tiga (3) jenis tenaga dalam cecair dan huraikan ketiga-tiganya.

[9 marks]

[9 markah]

CLO1
C3

(b)

$\varnothing_1 = 150$ mm
$P_1 = 200$ Pa

$\varnothing_2 = 200$ mm Z_2
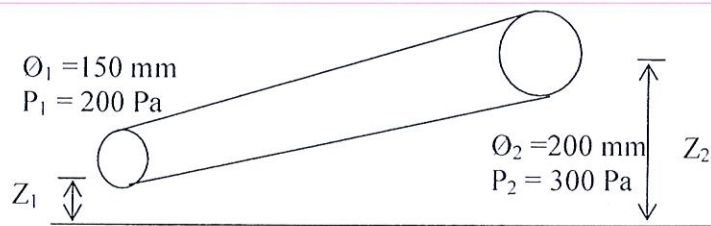$P_2 = 300$ Pa

Z_1

Figure B2 / *Rajah B2*

Water is flowing through a pipe with a diameter of 150 mm and 200 mm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 200 Pa and the pressure at the upper end is 300 Pa. Calculate the difference in datum head if the rate of flow through pipe is 0.05 m³/s.

Air mengalir dalam paip berdiameter 150 mm dan 200 mm dari hujung bawah ke atas. Taburan tekanan di hujung bawah ialah 200 Pa dan hujung atas 300 Pa. Kirakan perbezaan ketinggian paip dari datum jika kadar alir 0.05 m³/s.

[11 marks]
[11 markah]

QUESTION 3

SOALAN 3

CLO1
C2

a) A type of fluid flows through a pipe with a diameter of 50 cm has a velocity of 0.20 m/s and the kinematic viscosity is 1.14 mm²/s. Determine the type of flow in the pipe.

Sejenis cecair melalui sebatang paip berdiameter 50 cm mempunyai halaju 0.20 m/s dan kelikatan kinematik 1.14 mm²/s. Tentukan jenis aliran dalam paip tersebut.

[6 marks]
[6 markah]

CLO1
C3

b) Two pipes are connected parallel to each other between Tank A and Tank B as shown in **Figure B3**. The diameter is 50 mm for Pipe 1 and 100 mm for Pipe 2 and both pipes have length of 120 m. Calculate the discharge for both pipes if Darcy's coefficient, $f =$ 0.0075 and the difference in elevation is 11 m. Neglect all minor losses.

*Dua batang paip dihubungkan secara selari di antara Tangki A dan Tanki B seperti **Rajah B3**. Diameter Paip 1 ialah 50 mm dan diameter Paip 2 ialah 100 mm dan kedua-dua paip mempunyai panjang 120 m. Kirakan kadaralir di kedua-dua paip jika pekali Darcy, f = 0.0075 dan perbezaan ketinggian ialah 11 m. Abaikan kehilangan tenaga kecil.*
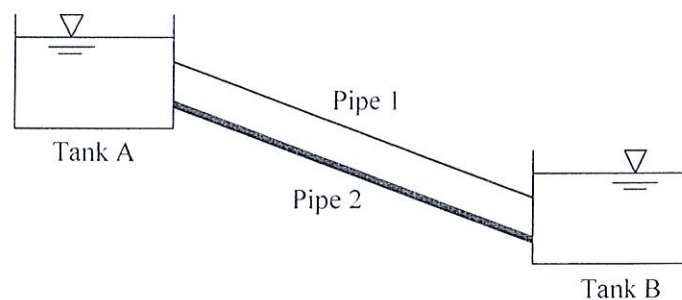

Figure B3 / Rajah B3

[14 marks]
[*14 markah*]

QUESTION 4
SOALAN 4

CLO1
C2

(a) **Calculate** the discharge through a trapezoidal channel of 8m width and side slopes of 1:3. The depth of water is 2.4m and the bed slope is 1:4000. Take Chezy's coefficient, C=60.

Kira kadar alir yang melalui saluran berbentuk trapezoid dengan lebar 8m dan cerun sisi 1:3. Kedalaman air adalah 2.4m dan cerun dasar 1:4000. Ambil pekali Chezy, C=60.

[10 marks]

[10 markah]

CLO1
C3

(b) Water flows in a rectangular channel with a discharge of $0.1m^3/s$. Calculate the bottom slope of the rectangular channel if the following data is given:

Width of channel   = 600mm

Depth of flow   = 300mm

Manning coefficient, N = 0.0013

Air mengalir di dalam sebuah saluran segiempat dengan kadar alir $0.1\ m^3/s$. Kira cerun dasar saluran segiempat tersebut jika data diberi seperti berikut:

Lebar saluran   = 600mm

Kedalaman aliran   = 300mm

Pekali Manning, N   = 0.0013

[10 marks]

[10 markah]

SOALAN TAMAT

FORMULA CC303 – HYDRAULICS 1

1. $P = \rho g h$

2. $Q = Av$

3. $H = \dfrac{P}{\rho g} + \dfrac{v^2}{2g} + z$

4. $Q = \dfrac{A_1 \, A_2}{\sqrt{(A_1^2 - A_2^2)}} \times \sqrt{2gH}$

5. $Q = A_1 \times \sqrt{\dfrac{2gH}{m^2 - 1}}$

6. $H = x\left(\dfrac{\rho_m - \rho_w}{\rho_w}\right)$

7. $Q_{actual} = C_d \times A_o \sqrt{2gH}$

8. $C_d = C_v \times C_c$; $C_c = \dfrac{Aj}{Ao}$; $C_v = \dfrac{v_{actual}}{v_{theory}}$

9. $h_f = \dfrac{4fLv^2}{2gd}$; $h_f = \dfrac{fLQ^2}{3d^5}$; $h_f = \dfrac{32\mu v L}{\rho g d}$

10. $R_e = \dfrac{\rho v d}{\mu}$; $R_e = \dfrac{vd}{\vartheta}$

11. $Q = AC\sqrt{mi}$

12. $Q = A\dfrac{m^{2/3} \, i^{1/2}}{N}$