SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI JUN 2016

CC501 : HYDRAULICS 2

TARIKH : 26 OKTOBER 2016
TEMPOH : 8.30 AM – 10.30 AM (2 JAM)

Kertas ini mengandungi **SEMBILAN (9)** halaman bercetak.

Bahagian A: Objektif (10 soalan)
Bahagian B: Struktur (4 soalan)

Dokumen sokongan yang disertakan : Kertas Graf, 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.*

CLO1
C1

QUESTION 1
SOALAN 1

Describe briefly with sketches the various methods used to calculate the pressure exerted by fluids

Berdasarkan lakaran, terangkan kaedah untuk mendapatkan tekanan didalam air.

[4 marks]
[*4 markah*]

CLO1
C2

QUESTION 2
SOALAN 2

Determine the hydrostatic force on the base of a cylindrical glass when filled with water as deep as 1.5m. The base area of cylindrical is $0.789m^2$.

Tentukan daya hidrostatik pada dasar sebuah selinder kaca jika dipenuhi air sedalam 1.5m. Keluasan dasar selinder adalah $0.789m^2$.

[4 marks]
[*4 markah*]

CLO 1
C1

QUESTION 3

SOALAN 3

Define the terms below:

Definisi istilah di bawah:

a. Metacenter / *Pusat meta*

b. Center of buoyancy / *Pusat keapungan*

[4 marks]
[*4 markah*]

CLO 1
C2

QUESTION 4

SOALAN 4

A rectangular block with a dimension of 16m length, 9m width and 0.6m depth, floats in water. If the depth of immersion (draft) is 0.1m, calculate the weight of the block.

Sebuah blok segiempat 16m panjang, 9m lebar dan 0.6m dalam, terapung di dalam air. Jika kedalaman yang tenggelam (draf) adalah 0.1m, kirakan berat blok tersebut.

[4 marks]
[*4 markah*]

CLO 1
C1

QUESTION 5

SOALAN 5

Define the momentum equation.

Takrifkan persamaan momentum.

[4 marks]
[*4 markah*]

CLO1
C2

QUESTION 6

SOALAN 6

The force exerted by a 25mm diameter water jet against a flat plate held normally is 700N. Calculate the velocity of jet in m/s.

Daya yang terhasil daripada hentaman jet air berdiameter 25mm terhadap plat rata dalam keadaan normal terhadap jet, ialah 700N. Kirakan halaju dalam m/s.

[4 marks]
[*4 markah*]

CLO 2
C1

QUESTION 7

SOALAN 7

List **FOUR (4)** parameters that cause non-uniform flow.

*Senaraikan **EMPAT (4)** parameter yang menyebabkan aliran tidak seragam*

[4 marks]
[*4 markah*]

CLO 2
C2

QUESTION 8

SOALAN 8

A rectangular open channel with 3m wide and 1.5 m height, carries water at a rate of 40 m^3/s. Determine Specific energy for this flow.

Saluran terbuka segi empat tepat dengan lebar 3m dan ketinggian sedalam 1.5m, mengalirkan air pada 40 m^3/s. Tentukan tenaga tentu untuk aliran ini.

[4 marks]
[*4 markah*]

CLO 2
C1

QUESTION 9

SOALAN 9

There are **THREE (3)** types of fluid flow through a centrifugal pump. State **TWO (2)** of them which can flow through a centrifugal pumps.

*Terdapat **TIGA (3)** jenis aliran melalui pam empar. Nyatakan **DUA (2)** daripadanya.*

[4 marks]
[*4 markah*]

CLO 2
C2

QUESTION 10

SOALAN 10

A centrifugal pump of 1.38 kW operates under a head of 25 m. It discharges oil at 3.6 m^3/s. Calculate the power required and the efficiency of the pump. The density of oil given is 1.15 kg/m^3.

Sebuah pam empar berkuasa 1.38 kW beroperasi pada turus 25 m mengalirkan minyak pada kadar 3.6 m^3/s. Tentukan kuasa pam yang diperlukan dan kecekapan operasi pam tersebut. Diberi nilai ketumpatan minyak adalah 1.15 kg/m^3.

[4 marks]
[*4 markah*]

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.*

QUESTION 1
SOALAN 1

CLO1
C3

a) A solid cylinder of 1 m diameter and 2.0 m in height weighing 7.848 kN is floating in the sea. The density of sea water is $1030kg/m^3$. Determine the location of metacenter if the cylinder float vertically.
Silinder bersaiz 1m diameter dan 2m tinggi dengan berat 7.848 kN terapung di dalam air air laut berketumpatan $1030kg/m^3$. Tentukan kedudukan pusat meta sekiranya silinder tersebut terapung dalam keadaan tegak.

[10 marks]
[*10 markah*]

CLO1
C3

b) By referring to **Figure B1**, calculate the horizontal force (F_H) and the vertical force (F_v) acting on the gate if the diameter of the gate is 4m and the length of the gate is 8m.
*Dengan merujuk **Rajah B1,** tentukan daya ufuk (F_H) dan daya menegak (F_v) yang bertindak sekiranya pintu air tersebut berdiameter 4m dan panjang pintu adalah 8m.*

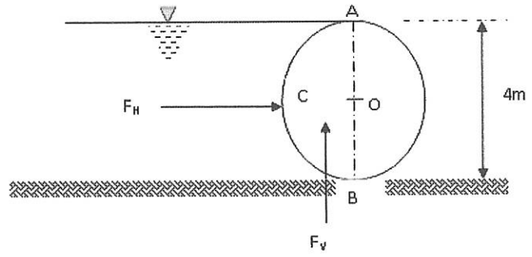


Figure B1 / *Rajah B1*

[10 marks]
[*10 markah*]

QUESTION 2

SOALAN 2

CLO1
C4

A water jet has been deflected by a smooth curve vane at 25^0 angle of deflection as shown in **Figure B2** below. When the diameter of the water jet is 25mm and the flow rate is $0.002m^3/s$, determine the magnitude and direction of the jet.

*Satu jet air telah dipesongkan oleh sebuah bilah lengkung licin pada sudut pesongan 25^0 seperti yang ditunjukkan dalam **Rajah B2** di bawah. Apabila diameter jet air adalah 25mm dan kadar alirannya $0.002m^3/s$, tentukan magnitud dan arah jet.*

[20 marks]
[*20 markah*]

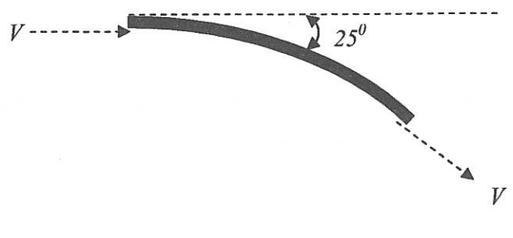


Figure B2 / Rajah B2

CLO2
C3

QUESTION 3

SOALAN 3

CLO2
C3

(a) Water flows at a rate of 30 m^3/sec in a channel of 23 metres wide with a velocity of 2.8 metres per second. Calculate:

Air mengalir pada kadar 30 m^3/s di dalam saluran yang lebarnya 23 meter dan halaju 2.8 meter per saat. Kira :

i. specific energy / *tenaga tentu*

ii. critical depth / *kedalaman kritikal*

iii. critical velocity / *halaju kritikal*

iv. minimum specific energy / *tenaga tentu minimum*

[10 marks]
[*10 markah*]

CLO2
C3

(b) Water flows in a rectangular channel with 1 metre wide and the depth of water is 0.2 m. Given Froude number is 2. Calculate :

Air mengalir di dalam saluran segiempat selebar 1 meter, kedalaman air 0.2 m. Diberi nombor Froude ialah 2. Kira :

(i) specific energy / *Tenaga tentu*

(ii) critical depth / *Kedalaman kritikal*

(iii) sequent depth and / *Kedalaman hilir dan*

(iv) head loss due to the hydraulic jump / *Kehilangan tenaga disebabkan lompatan hidraulik.*

[10 marks]
[*10 markah*]

QUESTION 4
SOALAN 4

CLO2
C4

A centrifugal pump operating at 830rev/min produces data as in **Table B4** below :
The pump delivers water from a low tank to a high tank through a 500mm diameter pipe along a 3000m total length of pipe. Given the friction coefficient, f = 0.0025 and the head difference between the two tanks is 15m;
*Sebuah pam empar beroperasi dengan kelajuan 830pusingan/min menghasilkan data seperti dalam **Jadual B4** di bawah :*
Pam ini telah digunakan untuk menyalurkan air dari sebuah tangki yang rendah kepada tangki yang tinggi menggunakan paip yang berdiameter 500mm sepanjang 3000m. Diberi pekali geseran, f = 0.0025 dan perbezaan turus di antara dua tangki tersebut ialah 15m.

i. Plot graphs of system characteristics
Tentukan kadaralir dan turus sistem pada titik optimum

ii. Determine the discharge and head for the system at optimum point
Tentukan kadaralir dan turus sistem pada titik optimum

iii. Determine the discharge, head and output power of the pump at operating point
Tentukan kadaralir, turus tekanan dan kuasa yang terhasil pada titik operasi

Discharge/*Kadar alir*, Q (liter/sec)	0	100	200	300	350	400	500
Head/*Turus*, H (m)	19	18	18	16	14	12	7
Efficiency/*Kecekapan*, η (%)	0	20	65	80	85	75	40

Table B4 / *Jadual B4*

[20 marks]
[*20 markah*]

SOALAN TAMAT

CIVIL ENGINEERING DEPARTMENT
CC501 –HYDRAULICS 2

A. HYDROSTATIC FORCE

1. $Fx = \rho g A\hat{y}$
2. $Fy = \rho g V$
3. $h_p = \hat{y} + \frac{Icg}{A\hat{y}} . \sin^2\theta$

B. BUOYANCY AND FLOATATION

1. $MG = \_BM - BG$
2. $BM = \frac{I}{V}$

C. MOMENTUM EQUATIONS

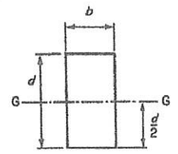
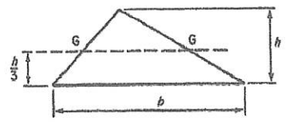
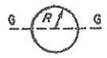
1. $F = \rho A v^2$
2. $F = \rho A(v- u)^2 \cos\theta$
3. $F = \rho A (v - (\frac{u}{\cos\theta})) (v \cos\theta - u)$
4. $Fx = \rho Q (v_{x1} - v_{x2})$
5. $Fy = \rho Q (v_{y1} - v_{y2})$
6. $\frac{P_1}{\rho g} + \frac{v_1}{2g} + z_1 = \frac{P_2}{\rho g} + \frac{v_2}{2g} + z_2$

D. NON-UNIFORM FLOW IN AN OPEN DUCT

1. $E = y + v^2/2g$
2. $yc = (q^2/g)^{1/3}$
3. $E \min = 1.5\, y_c$
4. $Fr = v / (gy)^{1/2}$
5. $Q = A (\frac{1}{n}) m^{2/3} (i^{1/2})$
6. $y_1 = y_2/2 [\sqrt{(1 + 8Fr_2^2)} -1]$
7. $P = \rho g Q \Delta E$
8. $\Delta E = \frac{(y_2 - y_1)^3}{4y_2y_1}$

E. PUMP

1. $Po = \rho g H Q$
2. $Pi = 2\Pi N T$
3. $Hf = f L Q^2 / 3D^5$
4. $Hs = Hstk + Hf$
5. $\eta = \dfrac{Q}{(Q_A/\eta_A)+(Q_B/\eta_B)}$
6. $\eta = \dfrac{H}{(H_A/\eta_A)+(H_B/\eta_B)}$
7. $\eta = \dfrac{\text{P output}}{\text{P input}}$

	Area A	Second moment of area I_{GG} about axis GG through the centroid
Rectangle 	bd	$\frac{bd^3}{12}$
Triangle 	$\frac{bh}{2}$	$\frac{bh^3}{36}$
Circle 	πR^2	$\frac{\pi R^4}{4}$