SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI JUN 2016

DCC5143: FLUID MECHANICS

TARIKH : 31 OKTOBER 2016
MASA : 2.30 PM - 4.30 PM (2 JAM)

Kertas ini mengandungi **SEBELAS (11)** halaman bercetak.
Bahagian A: Struktur (2 soalan)
Bahagian B: Struktur (4 soalan)
Dokumen sokongan yang disertakan : ~~Kertas Graf,~~ Formula dsb / ~~Tiada~~

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SECTION A: 50 MARKS

BAHAGIAN A: 50 MARKAH

INSTRUCTION:

This section consists of **TWO (2)** structured questions. Please answer **ALL** questions.

ARAHAN:

*Bahagian ini mengandungi **DUA (2)** soalan berstruktur. Sila jawab **SEMUA** soalan.*

QUESTION 1

SOALAN 1

CLO1
C1

(a) State **TWO (2)** differences in physical properties between liquid and gas.

*Nyatakan **DUA (2)** perbezaan ciri-ciri fizikal antara cecair dan gas.*

[5 marks]

[*5markah*]

CLO1
C2

(b) An object is located at a depth of 2 m from the surface of an oil with specific weight of 8.0 kN/m^3. Calculate:

i. Intensity of pressure at the point.

ii. The height of water column corresponding to the value of pressure

Satu objek berada pada kedalaman 2 m daripada permukaan minyak yang mempunyai berat tentu 8.0 kN/m^3. Kirakan:

i. Keamatan tekanan pada objek itu.

ii. Dapatkan ketinggian turus tekanan air.

[6 marks]

[*6 markah*]

CLO1
C3

(c) A differential manometer is connected to pipe A and B containing oil with specific gravity 0.8. The difference in mercury levels is 100 mm. Based on **Figure A1**, determine the pressure difference between the two pipes.

*Satu manometer kerbezaan disambungkan kepada paip A dan B yang mengandungi minyak dengan graviti tentu 0.8. Paras merkuri menunjukan perbezaan 100 mm. Berdasarkan **Rajah A1**, tentukan perbezaan tekanan antara dua paip tersebut.*

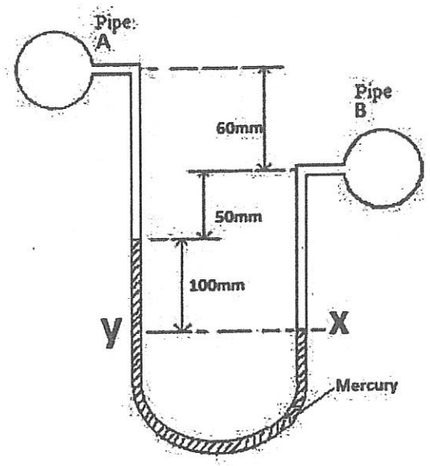


Figure A1 / *Rajah A1*

[14 marks]
[*14 markah*]

QUESTION 2
SOALAN 2

CLO2
C1

(a) Bernoulli's equation is used to determine the energy in liquid motion. State the Bernoulli's equation and energy involved.
Persamaan Bernoulli's digunakan untuk mendapatkan tenaga dalam pergerakan cecair. Nyatakan persamaan Bernoulli dan tenaga yang terlibat.

[4 marks]
[*4 markah*]

CLO2
C2

(b) An orifice has a diameter of 6cm at the wall of a tank discharging the water below 7 m of head. Calculate the real flowrate and water jet velocity at vena contracta if given Cd = 0.55 and Cv = 0.8.

Sebuah orifis mempunyai diameter 6 cm pada dinding tangki mengeluarkan air dibawah turus 7.0 m. Kirakan kadar alir sebenar dan halaju jet air pada vena kontrakta jika diberi Cd = 0.55 dan Cv = 0.8.

[9 marks]
[*9 markah*]

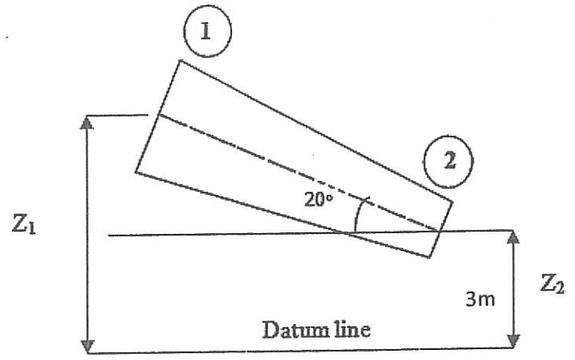


Figure A2 / Rajah A2

CLO2
C3

(c) **Figure A2** shows a diameter of a pipe changes from 250 mm at section 1 to 150 mm at section 2. Given length of pipe is 8 m and the pressure of water at section 1 is 500 kPa. If the velocity of flow at section is 1.5 m/s, calculate the intensity of pressure at section 2.

***Rajah* A2** *menunjukkan diameter paip berubah dari 250 mm di bahagian 1 kepada 150 mm pada bahagian 2. Diberi panjang paip 8 m dan tekanan air pada bahagian 1 sebanyak 500 kPa. Sekiranya halaju pada bahagian 1 ialah 1.5 m/s, kirakan keamatan tekanan pada bahagian 2.*

[12 marks]
[*12 markah*]

SECTION B: 50 MARKS
BAHAGIAN B: 50 MARKAH

INSTRUCTION:
This section consists of **FOUR (4)** structured questions. Please answer **TWO (2)** questions.
ARAHAN:
*Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Sila jawab **DUA (2)** soalan.*

QUESTION 1
SOALAN 1

CLO2
C2

(a) A ship with a mass of 4000 tons floating on sea (ρ_{sea} = 1029 kgm^{-3}). A 200 tons of ballast water was discharged from the ship and it immersed 6.4 m. Calculate the immersed depth, d of the ship floating in fresh water ($\rho_{fresh\ water}$ = 999 kgm^{-3}).

Sebuah kapal dengan jisim 4000 tan terapung di laut (ρ_{laut} = 1029 kgm^{-3}). Sebanyak 200 tan air dari tangki ballast dikeluarkan dan kapal tersebut tenggelam sedalam 6.4 m. Kirakan kedalaman kapal tenggela, d dalam air semasa terapung di air tawar. ($\rho_{air\ tawar}$ = 999 kgm^{-3}).

[10 marks]
[*10 markah*]

CLO2
C3

(b) Determine the metacentric of a ferry across the Selat Tebrau. The sea water density is 1029 kg/m^3. The ferry is 700 tones metric with a dimension of 40 m x 15 m x 10 m.
Tentukan pusat meta sebuah feri yang menyeberangi Selat Tebrau.Ketumpatan air laut ialah 1029 kg/m^3.Jisim feri ialah 700 tan metrik dan berukuran 40 m x 15 m x 10 m.

[15 marks]
[*15 markah*]

QUESTION 2
SOALAN 2

CLO2 C3

(a) An inclined water gate, 1.2 m x 1.5 m is immersed as shown in **Figure B2**. Determine the total resultant force acting on the gate and the location of center of pressure.

*Sebuah pintu air berukuran 1.2m x 1.5m tenggelam secara condong seperti **Rajah B2**. Tentukan jumlah daya paduan yang bertindak ke atas pintu dan lokasi pusat tekanan.*

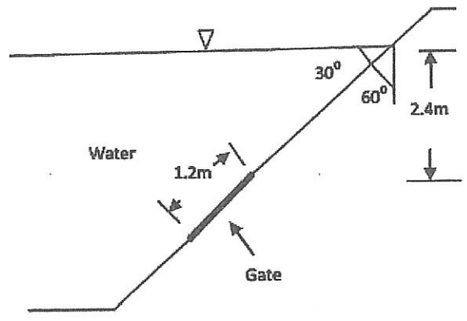


Figure B2 / Rajah B2

[10 marks]
[*10 markah*]

CLO2 C3

(b) A rectangular pontoon has a width of 6 m and length of 10 m immersed 2 m in water. Calculate:

i. weight of pontoon
ii. its immersed depth in sea water if density of sea water is 1025 kg/m^3
iii. the load that can be supported by the pontoon in water if the maximum depth permissible is 2.3 m.

Sebuah pontun berbentuk segi empat tepat mempunyai lebar 6 m, panjang 10 m dan tenggelam sedalam 2 m di dalam air. Kirakan:

i. berat pontun
ii. kedalaman tenggelam dalam air laut yang berketumpatan 1025 kg/m^3

iii. beban yang boleh disokong oleh pontun dalam air jika kedalaman tenggelam maksimum yang dibenarkan ialah 2.3 m.

[15 marks]
[*15 markah*]

QUESTION 3
SOALAN 3

CLO2 C2

(a) A pipe of 100 mm diameter branches into two pipes diameters of 100 mm and 50 mm respectively. The flow in the larger branch pipe is 2/3 of the main pipe and the remaining discharge is going through the smaller branch pipe. Determine the flowrate in the smaller pipe if the velocity at the main pipe is 17.66 m/s.

Satu paip berdiameter 100 mm bercabang dua menjadi paip berdiameter 100 mm dan 50 mm. Aliran pada cabang besar adalah 2/3 daripada aliran paip utama dan nilai selebihnya mengalir melalui cabang yang kecil. Dapatkan kadaralir pada paip yang kecil jika halaju pada paip utama adalah sebanyak 17.66 m/s.

[10 marks]
[*10 markah*]

CLO1 C3

(c) **Figure B3** shows water flows from tank A to tank B through two parallel pipes. The length and diameter of the pipes are given in **Table 1**. Calculate the flow rate in each pipe. Given friction factor = 0.008. Consider all head losses.

***Rajah B3** menunjukkan air mengalir dari tangki A ke B melalui dua paip selari. Panjang dan diameter paip adalah seperti di **Jadual 1**. Kirakan kadaralir bagi setiap paip. Diberi faktor geseran = 0.008. Ambilkira semua jenis kehilangan tenaga.*

Pipe	Diameter (mm)	Length (m)
1	50	120
2	100	120

Table 1 / Jadual 1

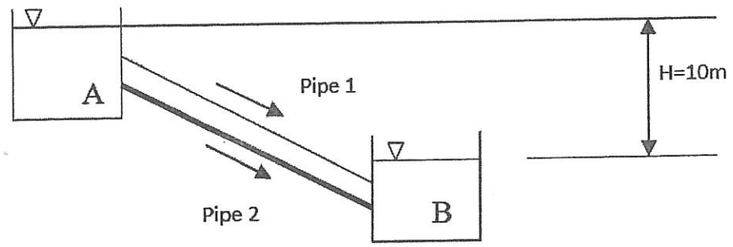


Figure B3 / *Rajah B3*

[15 marks]

[*15 markah*]

QUESTION 4

SOALAN 4

CLO2 C1 (a) Define the Newton's second law and Newton's Third law of motion.

Takrifkan Hukum Newton Kedua dan Hukum Newton Ketiga.

[4 marks]

[*4 markah*]

CLO2 C2 (b) An 85 mm diameter jet has a velocity of 40 meters per second strikes a flat plate. Calculate the normal pressure on the plate if:

i. The plate is static

ii. The plate is moving with a velocity of 25 m/sec and away from the jet.

Satu jet air berdiameter 85 mm dengan halaju 40 meter per saat menghentam sebuah plat rata. Kirakan daya normal ke atas plat jika:

i. Plat dalam keadaan pegun

ii. Plat bergerak dengan halaju 25 m/s menjauhi jet.

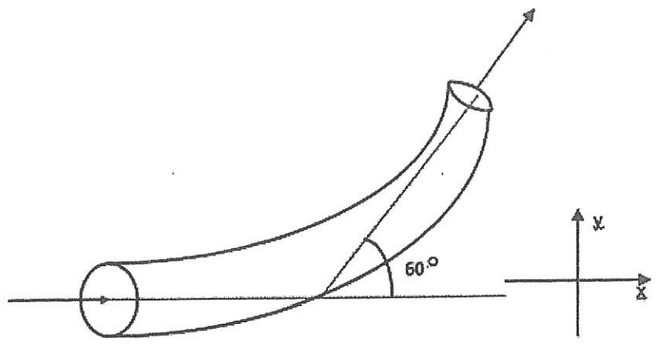
[9 marks]

[*9 markah*]

CLO2
C3

(c) A curved pipe was deflected to reduce the pipe diameter from 500 mm to 250 mm. The deflection of fluid is 60°. The pressure at the bend = 160 kN/m^2. The flow rate is 0.70 m^3/s. Based in **Figure B4**, calculate magnitude of resultant force at the bend.

*Satu paip melengkung berdiameter mengecil dari 500 mm ke 250 mm. Pesongan paip ialah 60°. Tekanan pada liku paip = 160 kN/m^2. Kadar alir ialah 0.70 m^3/s. Berdasarkan **Rajah B4**, kira magnitud daya paduan pada liku.*



plan view

Figure B4 / *Rajah B4*

[12 marks]
[*12 markah*]

SOALAN TAMAT

DCC 5143 : FLUID MECHANICS

LIST OF FORMULAE

- $P = \rho g h$
- $Q = Av$
- $H = \frac{P}{\rho g} + \frac{v^2}{2g} + z$
- $Q_{theory} = \frac{A_1\ A_2}{\sqrt{(A_1^2 - A_2^2)}} \times \sqrt{2gH}$
- $Q_{actual} = C_d \times \frac{A_1\ A_2}{\sqrt{(A_1^2 - A_2^2)}} \times \sqrt{2gH}$
- $H = h\left(\frac{\rho_m - \rho}{\rho}\right)$
- $Q_{actual} = C_d \times A_o \sqrt{2gH}$
- $C_d = C_v \times C_c$
- $C_c = \frac{Aj}{Ao}$
- $C_v = \frac{v_{actual}}{v_{theory}}$
- $h_f = \frac{4fLv^2}{2gd}$
- $h_f = \frac{fLQ^2}{3d^5}$
- $h_f = \frac{32\mu vL}{\rho g d}$

- $Fx = \rho g A\hat{y}$
- $Fy = \rho g V$
- $h_p = \hat{y} + \frac{Icg \cdot \sin^2\theta}{A\hat{y}}$
- $MG = BM - BG$
- $BM = \frac{I_{XX}}{V_d}$
- $F = \rho A v^2$
- $F = \rho A (v - u)^2 \cos\theta$
- $F = \rho A \left(v - \frac{u}{\cos\theta}\right)(v\cos\theta - u)$
- $Fx = \rho Q (v_{x1} - v_{x2})$
- $Fy = \rho Q (v_{y1} - v_{y2})$
- $\frac{P_1}{\rho g} + \frac{v_1}{2g} + Z_1 = \frac{P_2}{\rho g} + \frac{v_2}{2g} + Z_2$