

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN MALAYSIA**

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI JUN 2019

DCC5143 : FLUID MECHANICS

TARIKH : 07 NOVEMBER 2019

MASA : 8.30 PAGI - 10.30 PAGI (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

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

SECTION A: 50 MARKS**BAHAGIAN A: 50 MARKAH****INSTRUCTION:**

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

ARAHAN:

Bahagian ini mengandungi DUA (2) soalan berstruktur. Jawab SEMUA soalan.

QUESTION 1**SOALAN 1**

CLO1
C1

- (a) Define for the fluid properties below;

Takrifkan bagi sifat cecair di bawah;

- (i) Density

Ketumpatan

[3 marks]

[3 markah]

- (ii) Specific weight

Berat tentu

[2 marks]

[2 markah]

CLO1
C2

- (b) An object is located at a depth of 2m from the surface of an oil with specific weight of 8kN/m^3 . Calculate:

Objek yang terletak pada kedalaman 2m dari permukaan minyak dengan berat tentu 8kN/m^3 . Kirakan;

- (i) intensity of pressure at the point.

Keamatan tekanan di tempat berkenaan.

[4 marks]

[4 markah]

- (ii) the height of water column corresponding to the value of pressure.

Ketinggian air yang bersamaan dengan nilai tekanan.

[4 marks]

[4 markah]

CLO1
C3

- (c) A U-tube differential manometer shown in **Figure A1(c)** connects pipe A and B. Pipe A contains a liquid of specific gravity 1.594 under a pressure of $10.3 \times 10^4 \text{ N/m}^2$ and pipe B contains oil of specific gravity 0.8 under a pressure of $17.16 \times 10^4 \text{ N/m}^2$. Pipe A lies 2.5m above pipe B. Calculate the value of h .

Rajah A1(c) menunjukkan satu manometer pembezaan yang menghubungkan paip A dan B. Paip A mengandungi cecair yang mempunyai graviti tentu 1.594 di bawah tekanan $10.3 \times 10^4 \text{ N/m}^2$ dan paip B mengandungi minyak dengan graviti tentu 0.8 di bawah tekanan $17.16 \times 10^4 \text{ N/m}^2$. Paip A terletak 2.5m di atas paip B. Kirakan nilai h .

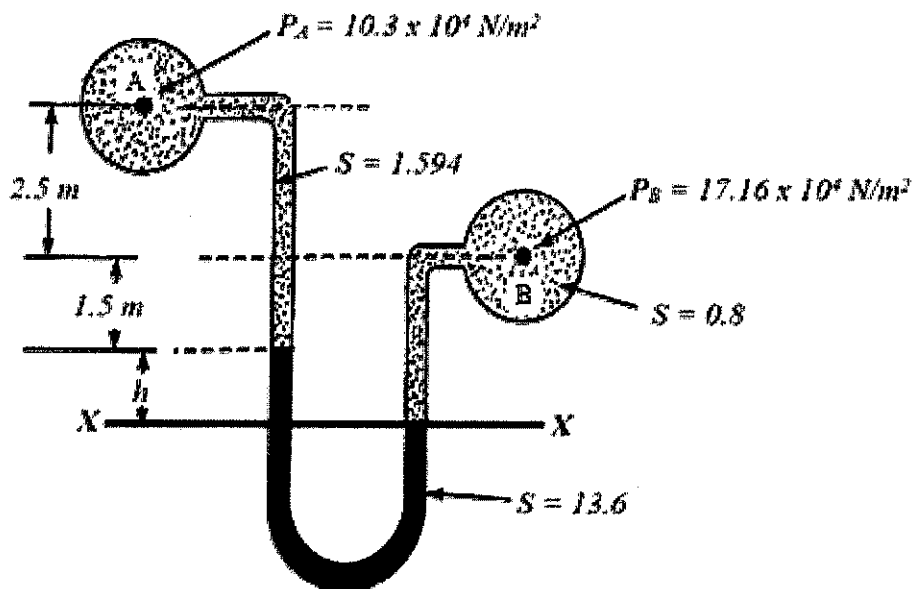


Figure A1(c) / Rajah A1(c)

[12 marks]
[12 markah]

QUESTION 2
SOALAN 2CLO1
C1

- (a) Energy loss for fluid flowing within a pipe system can be divided into major and minor losses. Define;

Kehilangan tenaga aliran bagi bendalir yang mengalir dalam paip terbahagi kepada kehilangan utama dan kehilangan kecil. Takrifkan;

- (i) major loss.
kehilangan utama

[2 marks]
[2 markah]

- (ii) minor loss.
kehilangan kecil

[3 marks]
[3 markah]

CLO1
C2

- (b) A horizontal pipe of diameter 150mm flowing water at 3.0m/s velocity. Calculate the head loss at the entrance of pipe and the flow rate.

Paip melintang berdiameter 150mm mengalirkan air pada halaju 3.0m/s. Kira kehilangan tenaga di pintu masuk dan kadar alirannya.

[8 marks]
[8 markah]

CLO1
C3

- (c) Two reservoirs are connected by series of line as shown in **Figure A2(c)**. Calculate the flow rate in the pipe of the following data given in **Table A2(c)**. Neglect all minor losses.

*Dua takungan dihubungkan secara siri seperti yang ditunjukkan dalam **Rajah A2(c)**. Kirakan kadar alir dalam paip mengikut data yang diberikan dalam **Jadual A2(c)**. Abaikan semua kehilangan kecil.*

Table A2(c) / Jadual A2(c)

Pipe	Diameter, d (mm)	Length, L (m)	Friction Factor, f
AB	120	50	0.01
BC	150	50	0.01

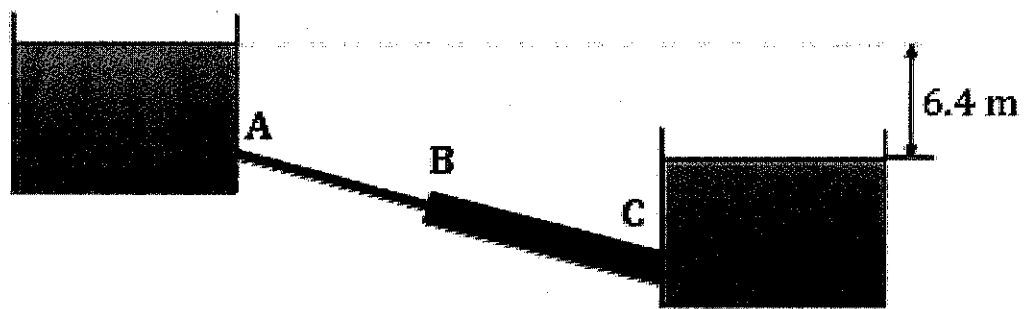


Figure A2(c) / Rajah A2(c)

[12 marks]
[12 markah]

SECTION B: 50 MARKS**BAHAGIAN B: 50 MARKAH****INSTRUCTION:**

This section consists of **FOUR (4)** structured questions. Answer **TWO (2)** questions only.

ARAHAN:

Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **DUA (2)** soalan sahaja.

QUESTION 1**SOALAN 1**

CLO2
C1

- (a) Define Centroid and Centre of pressure.

Takrifkan sentroid dan pusat tekanan.

[4 marks]

[4 markah]

CLO2
C2

- (b) A rectangular plate 4.5m wide and 8m height is immersed in liquid shown in **Figure B1(b)**. Calculate hydrostatic force that acts on the plate and the position of the centre of pressure. Given the density of liquid is 950 kg/m^3 .

*Sebuah plat segiempat berukuran 4.5 m lebar dan 8 m tinggi ditenggelam dalam cecair seperti yang ditunjukkan dalam **Rajah B1(b)**. Kirakan daya hidrostatik yang bertindak ke atas plat tersebut dan kedudukan pusat tekanannya. Diberi ketumpatan cecair tersebut adalah 950 kg/m^3 .*

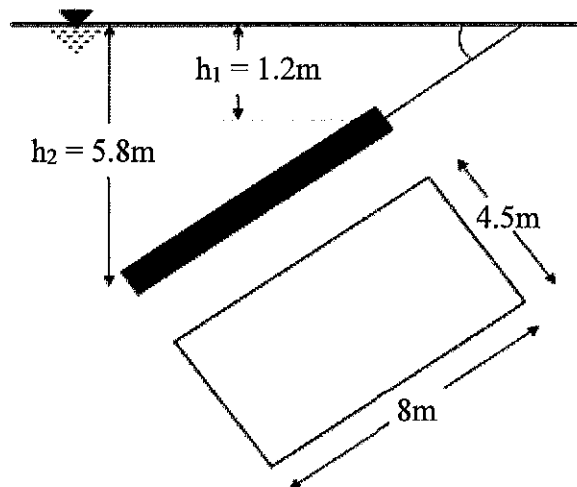


Figure B1(b) / Rajah B1(b)

[8 marks]

[8 markah]

CLO2
C3

- (c) Calculate the magnitude and the direction of the force that act on the curved plates 1.2m long as shown in the **Figure B1(c)** below.

*Kirakan magnitud dan arah daya paduan yang bertindak pada plat melengkung sepanjang 1.2m seperti dalam **Rajah B1(c)** di bawah.*

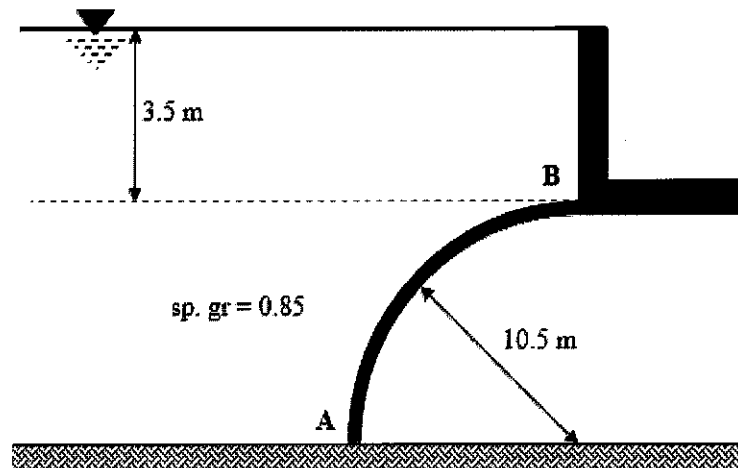


Figure B1(c) / Rajah B1(c)

[13 marks]

[13 markah]

QUESTION 2

SOALAN 2

CLO2
C1

- (a) Define meta centric and centre of buoyancy.
Berikan takrifan bagi pusat meta dan pusat keapungan.

[4 marks]

[4 markah]

CLO2
C2

- (b) A solid cylinder of 3m diameter floating in fresh water. If the draft of the cylinder is 2m, calculate;
Suatu silinder pepejal diameter 3m terapung di dalam air tawar. Jika draf silinder adalah 2m, kirakan;

- (i) Weight of cylinder.
Berat bagi silinder

[4 marks]

[4 markah]

- (ii) the draft of the cylinder if placed in seawater with a density of 1025 kg/m^3

draif silinder tersebut jika diletakkan di dalam air laut dengan ketumpatan 1025 kg/m^3 .

[4 marks]

[4 markah]

CLO2
C3

- (c) The specific gravity of wooden block is 0.65 and its length is 6.0 m floats in water as shown in **Figure B2(c)**. Calculate the metacentric height of the wooden block.

*Graviti tentu bagi blok kayu adalah 0.65 dan panjang 6.0 m terapung dalam air seperti dalam **Rajah B2(c)** di bawah. Kirakan ketinggian pusat meta bagi blok kayu tersebut.*

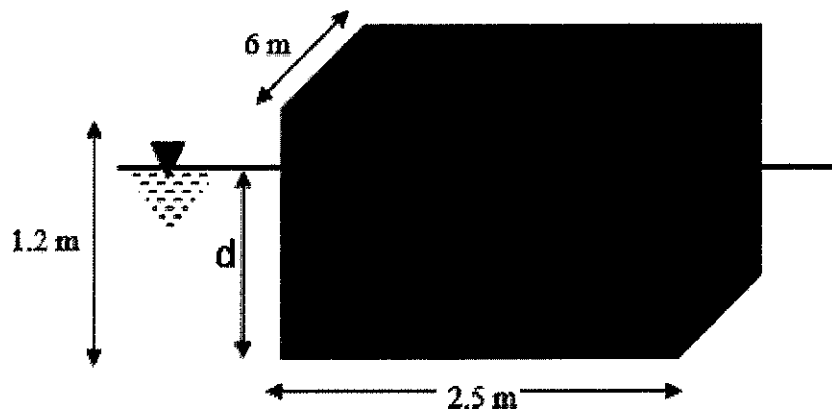


Figure B2(c) / Rajah B2(c)

[13 marks]

[13 markah]

QUESTION 3
SOALAN 3

CLO2
C1

- (a) Loss of energy in the pipeline occurs due to several factors. Identify **FOUR** (4) types of small energy losses in pipes.

Kehilangan tenaga di dalam aliran paip berlaku disebabkan beberapa faktor.

*Kenalpasti **EMPAT** (4) jenis kehilangan tenaga kecil dalam paip.*

[4 marks]

[4 markah]

CLO2
C2

- (b) Based on **Figure B3(b)** as shown below, the diameters of a pipe at the section 1 and 2 are 10cm and 15cm respectively. Calculate;

*Berdasarkan **Rajah B3(b)** yang ditunjukkan di bawah, diameter sebatang paip pada keratan 1 dan 2 adalah 10cm dan 15cm masing-masing. Kirakan;*

- (i) the flow rate through the pipe if the velocity of water flowing through the pipe at section 1 is 5m/s.

kadar alir yang melalui paip tersebut jika halaju aliran dalam keratan 1 adalah 5m/s.

[4 marks]

[4 markah]

- (ii) the velocity at section 2
halaju pada keratan 2

[4 marks]

[4 markah]

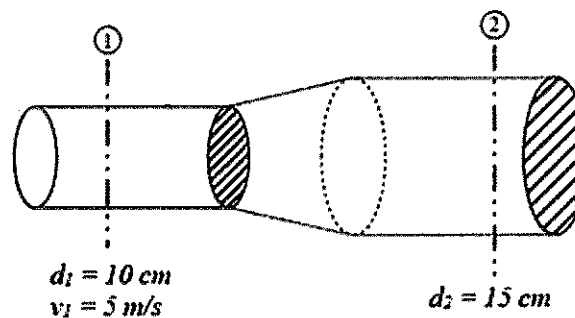


Figure B3(b) / Rajah B3(b)

CLO2
C3

- (c) A 35mm diameter of orifice drains water from the tank at a velocity of 8.5m/s. The water head above the orifice is 5.0 m. Calculate the coefficient of velocity (C_v), coefficient of contraction (C_c) and the coefficient of discharge (C_d) if the actual flow rate is 0.008 m³/s.

Satu orifis yang berdiameter 35mm mengalirkan air dari tangki dengan halaju 8.5m/s. Ketinggian turus air dari bukaan atas orifis adalah 5.0m. Kirakan nilai pekali halaju (C_v), pekali pengecutan (C_c) dan pekali kadar alir (C_d) jika kadar alir sebenar adalah 0.008 m³/s.

[13 marks]
[13 markah]

QUESTION 4 SOALAN 4

CLO2
C1

- (a) Describe the following law of motion;
Terangkan Hukum pergerakan berikut;

- (i) Newton's Second Law
Hukum Newton's kedua

[2 marks]
[2 markah]

- (ii) Newton's Third Law
Hukum Newton's Ketiga

[2 marks]
[2 markah]

CLO2
C2

- (b) A 75mm diameter jet of an oil having specific gravity 0.8 strikes normally a stationary flat plate. If the force exerted by the jet on the plate is 1200N, calculate the velocity of jet oil.

Satu jet minyak berdiameter 75mm yang mempunyai graviti tentu 0.8 menghentam sebuah plat rata. Jika daya hentaman jet minyak tersebut adalah sebanyak 1200N, kirakan halaju jet minyak tersebut.

[8 marks]
[8 markah]

CLO2
C3

- (c) A jet of water 50mm diameter and having a velocity of 25m/s enters tangentially a stationary curved vane without shock and is deflected through an angle of 45° shown in **Figure A4(c)** below. Calculate the magnitude and direction of the resultant force on the vane.

Satu jet air yang berdiameter 50mm dan mempunyai halaju 25m/s menghentam plat lengkung yang membias melalui sudut 45° ditunjukkan dalam **Rajah A4(c)** di bawah. Kirakan daya dan arah tindakan daya pada bilah tersebut.

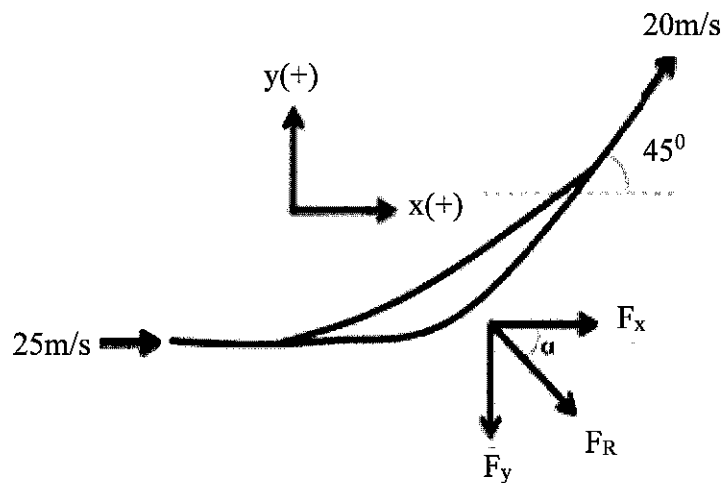


Figure A4(c) / Rajah A4(c)

[13 marks]
[13 markah]

SOALAN TAMAT

FORMULAE DCC5143 – FLUID MECHANICS

LIST FORMULAE	
1. $H = z + \frac{p}{\rho g} + \frac{v^2}{2g}$	12. $C_v = \frac{V_{actual}}{V_{theory}}$
2. $Q = C_d A \sqrt{\frac{2gH}{m^2 - 1}}$	13. $C_c = \frac{A_j}{A_o}$
3. $Q = C_d \frac{(A_1 A_2)}{\sqrt{(A_1^2 - A_2^2)}} \times \sqrt{2gh}$	14. $P = \rho gh$
4. $H = h \left(\frac{\rho_m}{\rho} - 1 \right)$	15. $Q = Av$
5. $Q = C_d A_o \sqrt{2gH}$	16. $F_x = \rho g A \bar{y}$
6. $C_d = C_v \times C_c$	17. $F_y = \rho G v$
7. $C_v = \sqrt{\frac{x^2}{4yh}}$	18. $h_p = \bar{y} + \frac{I_{cg} \sin^2 \theta}{A \bar{y}}$
8. $h_L = k \left(\frac{v^2}{2g} \right)$	19. $MG = BM - BG$
9. $h_L = k \frac{[(v_1 - v_2)^2]}{2g}$	20. $BM = \frac{I_{xx}}{V_d}$
10. $h_L = \left(\frac{1}{C_c} - 1 \right)^2 \frac{v^2}{2g}$	21. $F = \rho A v^2$
11. $h_L = \frac{4fL}{d} \frac{v^2}{2g} = \frac{fLQ^2}{3d^5}$	22. $F = \rho A (v-u)^2 \cos \theta$
	23. $F = \rho A (v - (u/\cos \theta)) (v \cos \theta - u)$
	24. $F_x = \rho Q (v_{x1} - v_{x2})$
	25. $F_y = \rho Q (v_{y1} - v_{y2})$