

**SULIT**



**KEMENTERIAN PENDIDIKAN TINGGI  
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI**

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

**JABATAN KEJURUTERAAN AWAM**

**PEPERIKSAAN AKHIR**

**SESI II : 2022/2023**

**DCC30122 : FLUID MECHANICS**

**TARIKH : 20 JUN 2023**

**MASA : 8.30 PG – 10.30 PG (2 JAM)**

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

Bahagian A: Subjektif (2 soalan)

Bahagian B: Subjektif (4 soalan)

Dokumen sokongan yang disertakan : Formula

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**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)** subjective questions. Answer **ALL** questions.

**ARAHAN :**

*Bahagian ini mengandungi DUA (2) soalan subjektif. Jawab SEMUA soalan.*

**QUESTION 1**

**SOALAN 1**

- |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CLO1 | <p>(a) Define a Newtonian and Non-Newtonian fluid.<br/> <i>Takrifkan bendalir Newtonian dan Bukan Newtonian</i></p> <p style="text-align: right;">[4 marks]<br/>[4 markah]</p>                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| CLO1 | <p>(b) Explain briefly the concept of Ideal fluid and Real Fluid.<br/> <i>Terangkan dengan ringkas konsep Bendalir Unggul dan Bendalir Sebenar.</i></p> <p style="text-align: right;">[8 marks]<br/>[8 markah]</p>                                                                                                                                                                                                                                                                                                                                                                                                       |
| CLO1 | <p>(c) A liquid with a mass of 600kg filled an open cylinder container with 75cm diameter and 100cm height, estimate;<br/> <i>Cecair berjisim 600kg memenuhi bekas silinder terbuka dengan diameter 75cm dan ketinggian 100cm, anggarkan;</i></p> <p>i. the volume and density of the liquid<br/> <i>isipadu dan ketumpatan cecair</i></p> <p style="text-align: right;">[6 marks]<br/>[6 markah]</p> <p>ii. the values of the specific weight and and specific volume of the liquid<br/> <i>nilai berat tentu dan isipadu tentu bagi cecair tersebut</i></p> <p style="text-align: right;">[7 marks]<br/>[7 markah]</p> |

**QUESTION 2****SOALAN 2**

- CLO1 (a) Pressure measurement are usually indicated in either absolute or gauges pressure. The absolute pressure at point A is  $750 \times 10^3 \text{ N/m}^2$ . Define the gauges pressure if the atmospheric pressure is  $101.3 \text{ kN/m}^2$ .  
*Pengukuran tekanan biasanya ditunjukkan sama ada dalam tekanan mutlak atau tolok. Tekanan mutlak pada titik A ialah  $750 \times 10^3 \text{ N/m}^2$ . Tentukan tekanan tolok jika tekanan atmosfera ialah  $101.3 \text{ kN/m}^2$ .*  
 [4 marks]  
 [4 markah]
- CLO1 (b) Pressure head in a piezometer is 1.5m above the point A in a pipe. Identify the pressure in water, oil ( $s = 0.8$ ) and mercury ( $s = 13.6$ ).  
*Bacaan pada sebuah piezometer adalah 1.5m di atas titik A dalam paip. Kenalpasti tekanan dalam air, minyak ( $s = 0.8$ ) dan raksa ( $s = 13.6$ ).*  
 [8 marks]  
 [8 markah]
- CLO1 (c) An inverted differential manometer is connected to two pipes A and B containing water as shown in Figure A2(c). The manometer contains Oil X and Oil Y with specific gravity of 0.9 and 0.8 respectively. If the value of  $H_1 = 70 \text{ cm}$ ,  $H_2 = 45 \text{ cm}$  and Z is  $1/3$  from the height of  $H_1$ ;  
*Sebuah manometer bezaan songsang disambungkan dengan dua paip A dan B yang mengandungi air seperti yang ditunjukkan dalam Rajah A2(c). Manometer mengandungi Minyak X dan Minyak Y dengan graviti tentu masing-masing 0.9 dan 0.8. Jika nilai  $H_1 = 70 \text{ cm}$ ,  $H_2 = 45 \text{ cm}$  dan Z adalah  $1/3$  daripada ketinggian  $H_1$ ;*  
 i. Express an equation for the pressure in the inverted U-tube differential manometer.  
*Tunjukkan persamaan dalam manometer U-tiub songsang tersebut.*  
 [6 marks]  
 [6 markah]

- ii. Identify the difference of pressure in pipe A and pipe B.

*Kenal pasti perbezaan tekanan di dalam paip A dan paip B*

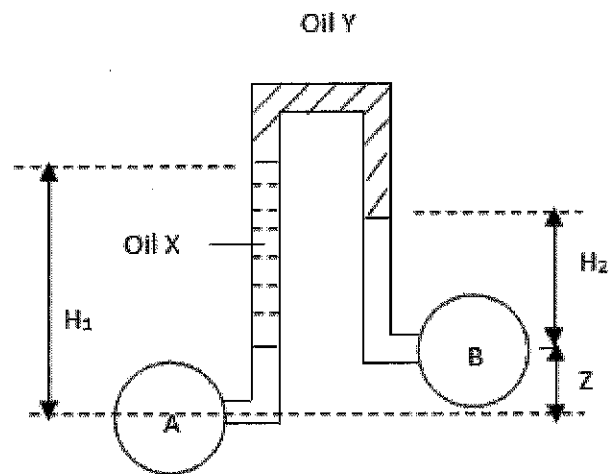


Figure A2 (c) / Rajah A2 (c)

[7 marks]

[7 markah]

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

**INSTRUCTION:**

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

**ARAHAN:**

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

**QUESTION 1**

**SOALAN 1**

- |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CLO2 | (a) Identify an open system and closed system.<br><i>Kenal pasti sistem terbuka dan sistem tertutup.</i><br><div style="text-align: right;">[4 marks]<br/>[4 markah]</div>                                                                                                                                                                                                                                                                                                                                                                             |
| CLO2 | (b) Reynolds Number is important in Hydrodynamic analysis. Interpret clearly the Reynolds number and the value of Reynolds number.<br><i>Nombor Reynolds penting dalam analisis Hidrodinamik. Tafsirkan dengan jelas mengenai nombor Reynolds dan nilai nombor Reynolds.</i><br><div style="text-align: right;">[9 marks]<br/>[9 markah]</div>                                                                                                                                                                                                         |
| CLO2 | (c) A pipe with a diameter of 225mm flows oil at a rate of 12000 liters per minute. If the relative density of oil is = 0.9 and the dynamic viscosity is $0.4\text{Ns/m}^2$ , calculate the Reynolds number and the type of flow;<br><i>Sebatang paip dengan diameter 225mm mengalirkan minyak pada kadar 12000 liter seminit. Jika ketumpatan relatif minyak ialah = 0.9 dan kelikatan dinamik ialah <math>0.4\text{Ns/m}^2</math>, kirakan nombor Reynolds dan jenis aliran;</i><br><div style="text-align: right;">[12 marks]<br/>[12 markah]</div> |

**QUESTION 2****SOALAN 2**

- CLO2 (a) Determine the Bernoulli's Equation by classifying for each the energy head involved.  
*Tentukan Persamaan Bernoulli dengan mengelaskan bagi setiap turus tenaga yang terlibat.*  

[4 marks]  
[4 markah]
- CLO2 (b) Calculate the total energy when water flows through the pipe. The pipe is 70mm diameter and pressure is  $150\text{kN/m}^2$  with an average flowrate of 200liters/sec. The pipe is at 7m from the datum.  
*Kirakan jumlah tenaga apabila air mengalir melalui dalam paip. Paip adalah berdiameter 70mm dan tekanan ialah  $150\text{kN/m}^2$  dengan kadar alir purata 200liter/saat. Paip berada pada 7m dari datum.*  

[9 marks]  
[9 markah]
- CLO2 (c) A venturi meter is placed horizontally with a main diameter of 30cm and a neck diameter of 20cm as shown in Figure B2(c) below. If the specific gravity (s) of the oil is 0.92 and the coefficient of flow,  $C_d = 1.1$ . Calculate the flow rate and velocity at the neck.  
*Sebuah meter venturi diletakkan di bahagian mendatar dengan diameter utama ialah 30cm dan diameter leher 20cm seperti yang ditunjukkan dalam Rajah B2(c) di bawah. Jika graviti tentu (s) bagi minyak adalah 0.92 dan Pekali kadar alir,  $C_d = 1.1$ . Kirakan kadar alir dan halaju di leher.*

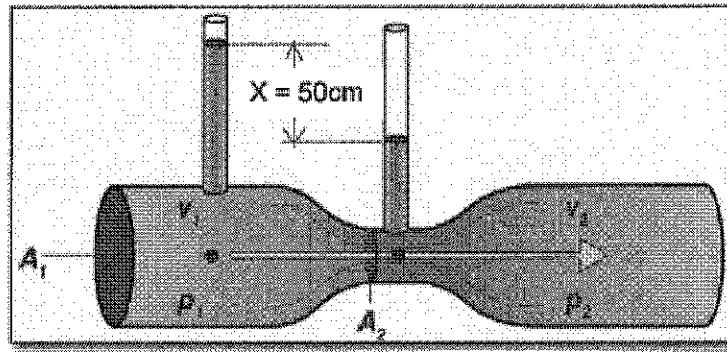


Figure B2(c) / Rajah B2(c)

[12 marks]

[12 markah]

**QUESTION 3****SOALAN 3**

- CLO2 (a) Energy loss in the pipe occurs due to several factors and occurs throughout the flow of the pipe. Identify **FOUR (4)** types of minor losses in pipe.
- Kehilangan tenaga didalam pipe berlaku disebabkan beberapa faktor dan berlaku sepanjang aliran pipe. Kenal pasti EMPAT(4) jenis kehilangan tenaga kecil dalam paip.*
- [4 marks]  
[4 markah]
- CLO2 (b) The amount of energy lost depends on a number of factors such as the fluid's speed and viscosity. Calculate the energy loss due to friction in a pipe, with the pipe length of 100m and diameter of 10cm. Given flow rate of water is 16 L/s and coefficient of friction = 0.01.
- Jumlah tenaga yang hilang bergantung kepada beberapa factor seperti kelajuan dan kelikatan bendalir. Kirakan kehilangan tenaga bagi geseran dalam paip, Panjang paip 100m dan garispusat paip ialah 10cm. Diberi kadar alir air ialah 16 L/s dan pekali geseran = 0.01.*
- [9 marks]  
[9 markah]

- CLO2 (c) Refer to Figure B3(c), two pipes are connected parallel to each other between two reservoirs. The diameter is 50mm for pipe 1 and 100mm for pipe 2 and both pipes have the length of 200m. If the flow is  $0.01\text{m}^3/\text{s}$  in pipe 2, calculate the discharge in pipe 1. Given coefficient of friction, ( $f_1 = f_2 = 0.008$ )

*Merujuk Rajah B3(c), dua paip disambungkan secara selari diantara dua takungan. Garis pusat paip 1 ialah 50mm dan garispusat paip 2 ialah 100mm dan kedua-dua paip mempunyai panjang 200m. Jika kadaralir adalah  $0.01\text{m}^3/\text{s}$  dalam paip 2, kirakan kadaralir aliran dalam paip 1. Diberi pekali geseran, ( $f_1 = f_2 = 0.008$ )*

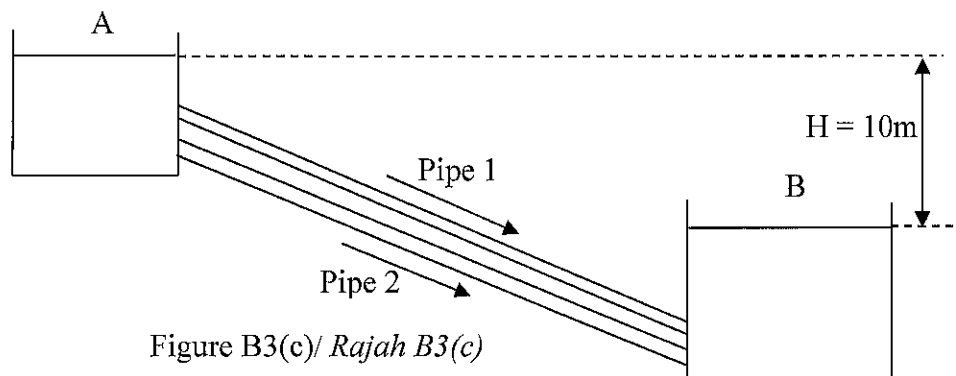


Figure B3(c)/ Rajah B3(c)

[12 marks]

[12 markah]

**QUESTION 4****SOALAN 4**

- CLO2 (a) Newton's law for fluids states that the rate of shear strain in a fluid is directly proportional to applied shear stress. Explain the Newton's Second Law and Newton's Third Law.

*Hukum Newton untuk bendalir menyatakan bahawa kadar terikan ricih dalam bendalir adalah berkadar terus dengan tegasan ricih yang dikenakan. Terangkan Hukum Newton's Kedua dan Hukum Newton's Ketiga.*

[4 marks]

[4 markah]

- CLO2 (b) A oil jet with 75mm diameter having specific gravity 0.8 strikes normally a stationary flat plate. If the force exerted by the oil jet the plate is 1200N, calculate the velocity of jet oil.

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

[9 marks]

[9 markah]

- CLO2 (c) A jet of water of 60mm diameter strikes a curved vane at its centre with a velocity of 18m/s. The curved vane is moving with a velocity of 6 m/s in the direction of the jet. The jet is deflected through an angle of  $165^\circ$ . Assuming friction on the plates; calculate the water jet impact force on the vane in the direction jet.

*Pancutan air berdiameter 60mm mengenai ram melengkung di tengahnya dengan halaju 18m/s. Ram melengkung bergerak dengan halaju 6m/s ke arah jet. Pancutan itu dipesongkan melalui sudut  $165^\circ$ . Dengan mengandaikan geseran pada plat; kirakan daya hentaman jet air pada ram dalam arah hentaman jet air*

[12 marks]

[12 markah]

**SOALAN TAMAT**

# FORMULA DCC30122 – FLUID MECHANICS

## LIST FORMULA

$$1. P = \rho gh$$

$$2. R_e = \frac{\rho vd}{\mu} @ R_e = \frac{vd}{\nu}$$

$$3. H = z + \frac{p}{\rho g} + \frac{v^2}{2g}$$

$$4. H = \left( \frac{\rho_m}{\rho_o} - 1 \right) x h$$

$$5. Q = C_d A \sqrt{\frac{2gH}{m^2 - 1}} @$$

$$Q = C_d \left[ \frac{A_1 x A_2}{\sqrt{A_1^2 - A_2^2}} \right] x \sqrt{2gH}$$

$$6. v_{act} = C_v x \sqrt{2gH}$$

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

$$8. C_c = \frac{A_j}{A_o}$$

$$9. C_v = \frac{V_{actual}}{V_{theory}}$$

$$10. C_d = C_v x C_c$$

$$11. Q = \frac{2}{3} C_d b \sqrt{2g} (H_2^{3/2} - H_1^{3/2})$$

$$12. h_L = k \left( \frac{v^2}{2g} \right)$$

$$13. h_L = k \frac{[(v_1 - v_2)^2]}{2g}$$

16.

$$17. P = \rho gh$$

$$18. \mu = \nu x \rho$$

$$19. Q_1 = Q_2$$

$$20. H = \left[ \frac{S_{mercury} - S_{liquid}}{S_{liquid}} \right] x h$$

$$21. F = \rho A v^2$$

$$22. F = \rho A (v - u)^2 \cos \theta$$

$$23. F = \rho A (v - (u / \cos \theta)) (v \cos \theta - u)$$

$$24. F_x = \rho Q (v_{x1} - v_{x2})$$

$$25. F_y = \rho Q (v_{y1} - v_{y2})$$

26.

27.

$$14. h_L = \left( \frac{1}{C_c} - 1 \right)^2 \frac{v^2}{2g}$$

$$15. hf = \frac{4fL}{d} \frac{v^2}{2g} = \frac{fLQ^2}{3d^5}$$