

SULIT



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

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

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI II : 2023/2024

DBM10143 : CALCULUS AND ALGEBRA

TARIKH : 25 MEI 2024

MASA : 11.30 PAGI - 1.30 PETANG (2 JAM)

Kertas ini mengandungi **LAPAN (8)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

INSTRUCTION:

This section consists of **FOUR (4)** questions. Answers **ALL** questions.

ARAHAN:

Bahagian ini mengandungi EMPAT (4) soalan. Jawab SEMUA soalan.

QUESTION 1**SOALAN 1**

- CLO1 (a) Convert the following numbering systems into an octal and binary number system.
Tukarkan sistem nombor berikut kepada sistem nombor asas lapan dan asas dua.
- i. 195_{10} [5 marks]
[5 markah]
- ii. $F05_{16}$ [5 marks]
[5 markah]
- CLO1 (b) Express the following by using binary arithmetic operations.
Nyatakan yang berikut dengan menggunakan operasi asas dua aritmetik.
- i. $1100_2 \times 100_2 - 10011_2$ [5 marks]
[5 markah]
- ii. $111000_2 + (1001_2 \times 111_2)$ [5 marks]
[5 markah]
- iii. $(11110_2 + 111_2) - (10001_2 + 100_2)$ [5 marks]
[5 markah]

QUESTION 2

SOALAN 2

CLO1

- (a) Figure 2(a) shows a circle with center O. The radius of OM is 6 cm. Express the values for the followings:

Rajah 2(a) menunjukkan sebuah bulatan berpusat O. Jejari OM ialah 6 cm.

Nyatakan nilai bagi yang berikut:

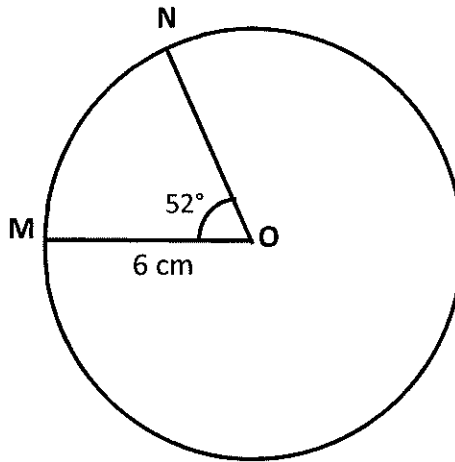


Figure 2(a) / *Rajah 2(a)*

- i. The circumference and area of the circle.

Lilitan dan luas bulatan.

[4 marks]

[4 markah]

- ii. The arc length of the minor sector OMN.

Panjang lengkok bagi sektor kecil OMN.

[3 marks]

[3 markah]

- CLO1 (b) Based on the figure 2(b), express the values for the followings:
Berdasarkan rajah 2(b), nyatakan nilai bagi yang berikut:

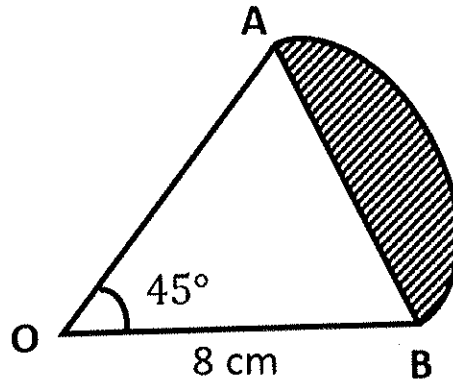


Figure 2(b) / Rajah 2(b)

- i. Area of sector OAB.
Luas kawasan sektor OAB.

[4 marks]

[4 markah]

- ii. Area of the segment.
Luas kawasan segmen.

[4 marks]

[4 markah]

CLO1

- (c) Figure 2(c) shows two solid cylinders with a radius of 3 cm and a height of 4 cm are located at the bottom of a rectangular container filled with water. Show calculation of the followings:

Rajah 2(c) menunjukkan dua buah silinder pepejal berjejari 3 cm dan tinggi 4 cm terletak di bahagian bawah bekas segi empat tepat berisi air. Tunjukkan pengiraan bagi yang berikut:

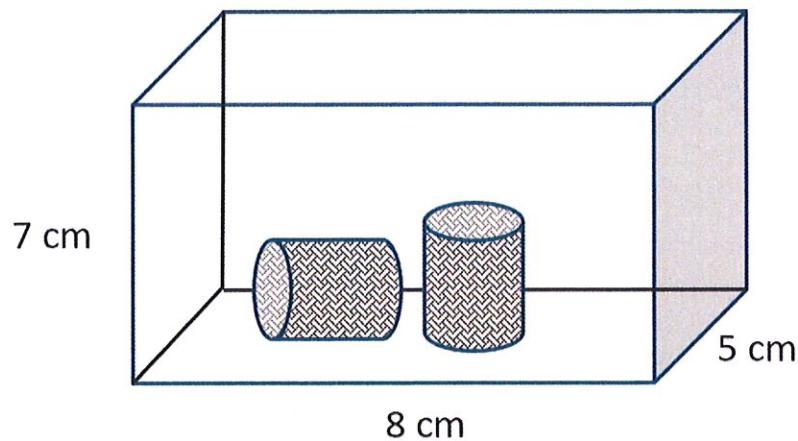


Figure 2(c) / *Rajah 2(c)*

- i. The volume of the two solid cylinders
Isipadu dua silinder pepejal tersebut.
- ii. The volume of the remaining water in the container.
Isipadu air yang tinggal di dalam bekas.

[5 marks]

[5markah]

[5 marks]

[5 markah]

QUESTION 3

SOALAN 3

- CLO1 (a) Given two vectors, \vec{A} and \vec{B} with components $\vec{A} = 6\vec{i} + 8\vec{j}$ and $\vec{B} = 3\vec{i} + 4\vec{j}$. Express the values for the followings:
Diberi dua vektor, \vec{A} dan \vec{B} dengan komponen $\vec{A} = 6\vec{i} + 8\vec{j}$ dan $\vec{B} = 3\vec{i} + 4\vec{j}$. Nyatakan nilai bagi yang berikut:
- i. $|2\vec{A}|$ [3 marks]
 [3 markah]
- ii. $2\vec{A} - 3\vec{B}$ [3 marks]
 [3 markah]
- iii. \hat{A} [4 marks]
 [4 markah]
- CLO1 (b) Given two vectors, $\vec{P} = 4\vec{i} - 2\vec{j} + 3\vec{k}$ and $\vec{Q} = -2\vec{i} + 6\vec{j} - 5\vec{k}$, express:
Diberi dua vektor, $\vec{P} = 4\vec{i} - 2\vec{j} + 3\vec{k}$ dan $\vec{Q} = -2\vec{i} + 6\vec{j} - 5\vec{k}$, nyatakan:
- i. Angle between vector \vec{P} and vector \vec{Q} .
Sudut di antara vektor \vec{P} dan vector \vec{Q} . [9 marks]
 [9 markah]
- ii. Area of the parallelogram formed by two vectors \vec{P} and \vec{Q} .
Luas segiempat selari yang dibentuk oleh dua vektor \vec{P} dan \vec{Q} . [6 marks]
 [6 markah]

QUESTION 4

SOALAN 4

- CLO1 (a) Express the derivative for each of the following function:
Nyatakan pembezaan bagi setiap fungsi yang berikut:
- i. $y = (x - 10)^4$
[3 marks]
[3 markah]
- ii. $y = (3x + 7)^{-5}$
[3 marks]
[3 markah]
- iii. $y = 2x(x + 4)^3$
[4 marks]
[4 markah]
- CLO1 (b) Express the following indefinite integrals:
Nyatakan kamiran tak tentu bagi yang berikut:
- i. $\int (1 + 2x + 4x^2) dx$
[3 marks]
[3 markah]
- ii. $\int \frac{2}{x^2} + 3 dx$
[3 marks]
[3 markah]
- iii. $\int \frac{24}{(3x-5)^2} dx$
[4 marks]
[4 markah]

- CLO1 (c) Identify the value of $\int_1^4 (5x^2 - 3x) dx$.
Kenal pasti nilai bagi $\int_1^4 (5x^2 - 3x) dx$.

[5 marks]

[5 markah]

SOALAN TAMAT

FORMULA SHEET FOR DBM10143: CALCULUS AND ALGEBRA

VECTOR & SCALAR

1. **Magnitude Vector;** $|\vec{A}| = \sqrt{a^2 + b^2 + c^2}$

2. **Unit Vector;** $\hat{u} = \frac{\vec{u}}{|\vec{u}|}$

3. **Cos θ** = $\frac{\vec{A} \cdot \vec{B}}{|\vec{A}||\vec{B}|}$

4. **Scalar Product;**

$$\vec{A} \cdot \vec{B} = a_1a_2 + b_1b_2 + c_1c_2$$

5. **Vector Product;**

$$\vec{A} \times \vec{B} = \begin{vmatrix} i & j & k \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix}$$

6. **Area of parallelogram ABC;**

$$A = |\vec{AB} \times \vec{BC}|$$

7. **Area of triangle ABC;**

$$A = \frac{1}{2} |\vec{AB} \times \vec{BC}|$$

CIRCLES

Radian to Degree

$$\theta = \text{value in radian} \times \frac{180^\circ}{\pi}$$

Degree to Radian

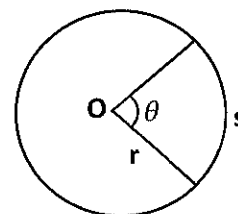
$$\theta = \text{value in degree} \times \frac{\pi}{180^\circ}$$

Arc Length

$$s = r\theta \quad (\theta \text{ in radian})$$

Area of Sector

$$A = \frac{1}{2}r^2\theta \quad (\theta \text{ in radian})$$



Area of Segment

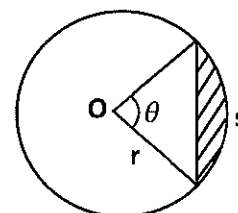
$$A = \frac{1}{2}r^2(\theta_1 - \sin\theta_2)$$

or

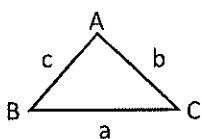
$$A = \frac{1}{2}r^2\theta_1 - \frac{1}{2}r^2\sin\theta_2$$

θ_1 must be in radian

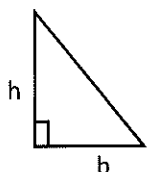
θ_2 must be in degree



Formula of triangle



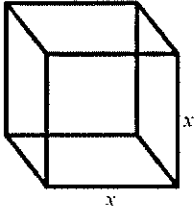
$$\text{Area of triangle} = \frac{1}{2}ab \sin c$$



$$\text{Area of right angle triangle} = \frac{1}{2}bh$$

Surface area and Volume

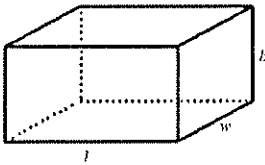
Cube



$$A = 6x^2$$

$$V = x^3$$

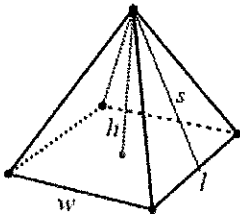
Cuboid



$$A = 2(wh + lw + lh)$$

$$V = lwh$$

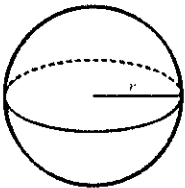
Pyramid



$$A = wl + 2ls$$

$$V = \frac{1}{3} \times wl \times h$$

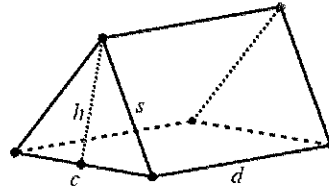
Sphere



$$A = 4\pi r^2$$

$$V = \frac{4}{3}\pi r^3$$

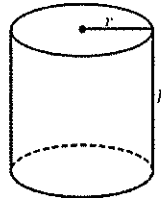
Prism



$$A = ch + cd + 2sd$$

$$V = \frac{1}{2} \times ch \times d$$

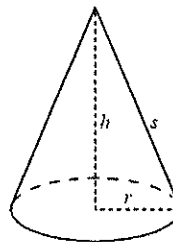
Cylinder



$$A = 2\pi rh + 2\pi r^2$$

$$V = \pi r^2 h$$

Cone



$$A = \pi rs + \pi r^2$$

$$V = \frac{1}{3}\pi r^2 h$$

DIFFERENTIATION

1.	$\frac{d}{dx}(k) = 0, k \text{ is constant}$	2.	$\frac{d}{dx}(ax^n) = anx^{n-1}$ [Power Rule]
3.	$\frac{d}{dx}(f(x) \pm g(x)) = f'(x) \pm g'(x)$	4.	$\frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx}$ [Product Rule]
5.	$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$ [Quotient Rule]	6.	$\frac{dy}{dx} = \frac{du}{dx} \times \frac{dy}{du}$ [Chain Rule]

INTEGRATION

1.	$\int ax^n dx = \frac{ax^{n+1}}{n+1} + c; \{n \neq -1\}$	2.	$\int (ax + b)^n dx = \frac{(ax + b)^{n+1}}{(a)(n+1)} + c; \{n \neq -1\}$
3.	$\int k dx = kx + c, k \text{ is constant}$	4.	$\int_a^b f(x) dx = F(b) - F(a)$