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 : 2024/2025

DBM10143 : CALCULUS AND ALGEBRA

TARIKH : 16 MEI 2025
MASA : 8.30 PAGI - 10.30 PAGI (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)

INSTRUCTION:

This paper consists of **FOUR (4)** structured questions. Answer **ALL** the questions.

ARAHAN:

*Kertas ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **SEMUA** soalan.*

QUESTION 1

SOALAN 1

CLO1

a) Convert the following number system into the hexadecimal using binary as an intermediary.

Tukarkan sistem nombor berikut kepada asas enam belas dengan menggunakan asas dua sebagai perantaraan.

i. 625_8

[5 marks]

[*5 markah*]

ii. 3127_{10}

[5 marks]

[*5 markah*]

CLO1

b) Calculate the following binary arithmetic operations.

Hitung yang berikut dengan menggunakan operasi asas dua aritmetik.

i. $(1110011_2 - 10111_2) - (101001_2 + 10101_2)$

[5 marks]

[*5 markah*]

ii. $111_2 \times (101001_2 - 10101_2)$

[5 marks]

[*5 markah*]

iii. $(101100_2 + 11101_2) - (1010_2 \times 101_2)$

[5 marks]

[*5 markah*]

QUESTION 2

SOALAN 2

CLO1

a) Figure 2(a) shows a circle with center O. The radius of OP is 7.5 cm. Compute the:
Rajah 2(a) menunjukkan sebuah bulatan berpusat O. jejari OP adalah 7.5 cm. Kirakan nilai:

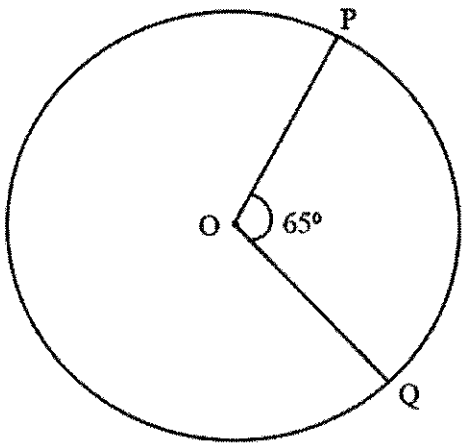


Figure 2(a) / *Rajah 2(a)*

i. Circumference and area of the circle.
Lilitan dan luas bulatan.

[4 marks]
[*4 markah*]

ii. Arc length of the major sector OPQ.
Panjang lengkok bagi sector major OPQ.

[3 marks]
[*3 markah*]

CLO1

b) Figure 2(b) shows the top view of a dam formed from the combination of two semicircular lakes, PQT and OST, centered at O and R respectively. The length of OP is 56 m. Calculate the;

Rajah 2(b) menunjukkan pandangan atas sebuah empangan yang terbentuk dari gabungan dua buah tasik berbentuk semibulatan PQT dan OST masing-masing berpusat di O dan R. Panjang OP ialah 56 m. Kirakan;

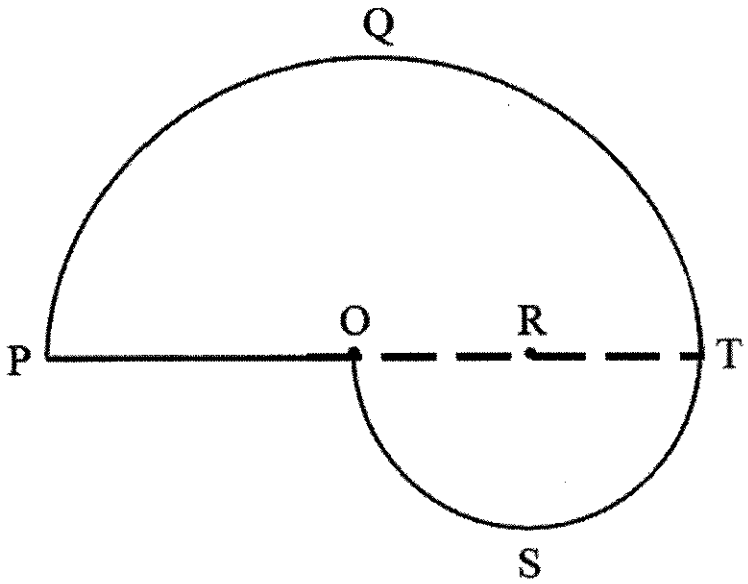


Figure 2(b) / *Rajah 2(b)*

i. perimeter in m, of the lake.
perimeter dalam m, tasik itu.

[4 marks]
[*4 markah*]

ii. area in m^2 of the lake.
luas dalam m^2 tasik itu.

[4 marks]
[*4 markah*]

CLO1

c) Figure 2(c) shows a cylindrical container filled with mineral water and an empty cuboid container was used for mixing drinking water. The volume of cylindrical container is equal to the volume of cuboid container. All the water in the cylindrical container was poured into the cuboid container.Calculate:
Rajah 2(c) menunjukkan sebuah bekas berbentuk silinder yang dipenuhi dengan air mineral dan sebuah bekas kuboid kosong untuk membancuh air minuman. Isipadu bekas silinder adalah sama dengan isipadu bekas kuboid. Semua air daripada bekas silinder dituang ke dalam bekas kuboid.Hitung:

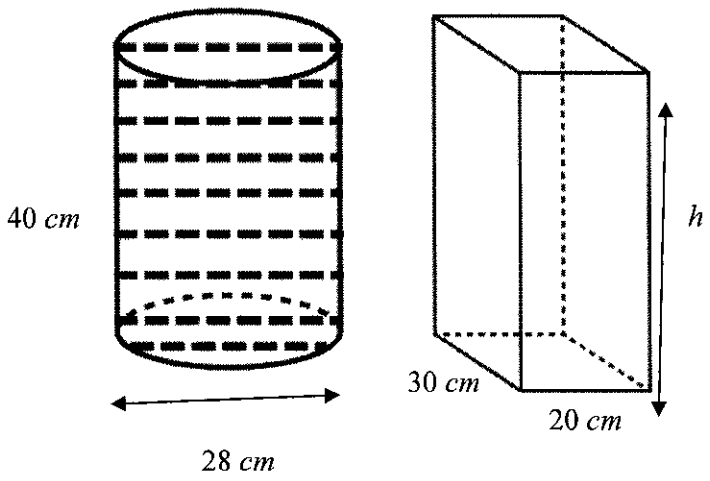


Figure 2(c) / *Rajah 2(c)*

i. *h*, in cm, the water level inside the cuboid.
h, dalam cm, paras air di dalam kuboid itu.

[5 marks]
[*5 markah*]

ii. surface area of both the cylindrical and cuboid containers.
luas permukaan bagi kedua-dua bekas silinder dan bekas kuboid.

[5 marks]
[*5 markah*]

QUESTION 3

SOALAN 3

CLO1

a) Given two vectors, $\vec{C}$ and $\vec{D}$ with components $\vec{C} = 8\tilde{\imath} + 3\tilde{\jmath}$ and $\vec{D} = -4\tilde{\imath} - 5\tilde{\jmath}$.
Express the values of the following:
Diberi dua vektor, $\vec{C}$ *dan* $\vec{D}$ *dengan komponen* $\vec{C} = 8\tilde{\imath} + 3\tilde{\jmath}$ *dan* $\vec{D} = -4\tilde{\imath} - 5\tilde{\jmath}$. *Nyatakan nilai yang berikut:*

i. $-5\vec{D} + 2\vec{C}$

[3 marks]
[*3 markah*]

ii. $|3\vec{D}|$

[3 marks]
[*3 markah*]

iii. $\hat{C}$

[4 marks]
[*4 markah*]

CLO1

b) Given two vectors, $\vec{S} = 3\tilde{\imath} + 2\tilde{\jmath} + 4\tilde{\mathrm{k}}$ and $\vec{T} = \tilde{\imath} + 3\tilde{\jmath} + 2\tilde{k}$, calculate:
Diberi dua vektor, $\vec{S} = 3\tilde{\imath} + 2\tilde{\jmath} + 4\tilde{\mathrm{k}}$ *dan* $\vec{T} = \tilde{\imath} + 3\tilde{\jmath} + 2\tilde{k}$, *kirakan:*

i. Angle between vector $\vec{S}$ and vector $\vec{T}$.
Sudut di antara vektor $\vec{S}$ dan vektor $\vec{T}$

[9 marks]
[9 *markah*]

ii. Area of the parallelogram formed by two vectors $\vec{S}$ and vector $\vec{T}$.
Luas segi empat selari yang dibentuk oleh dua vektor $\vec{S}$ and vektor $\vec{T}$.

[6 marks]
[6 *markah*]

QUESTION 4

SOALAN 4

CLO1

a) Calculate the derivative for each of the following function:
Kirakan pembezaan bagi setiap fungsi yang berikut:

i. $y = (-2x + 5)^{-3}$

[5 marks]
[*5 markah*]

ii. $y = 4x(x + 5)^3$

[5 marks]
[*5 markah*]

CLO1

b) Calculate the following indefinite integrals:
Kirakan kamiran tak tentu bagi yang berikut:

i. $\int \frac{3}{x^2} + 5x \ dx$

[5 marks]
[*5 markah*]

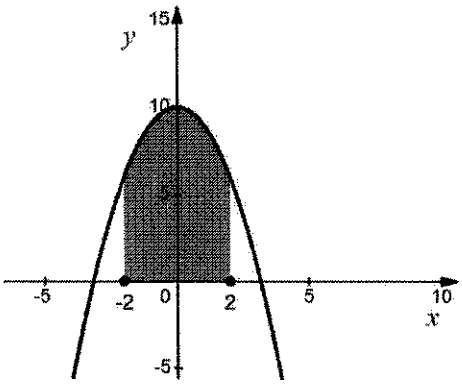
ii. $\int \frac{20}{(-2x+3)^3} \ dx$

[5 marks]
[*5 markah*]

CLO1

c) Calculate the area between the curve $y = 10 - x^2$ and the x-axis between $x = -2$ and $x = 2$.

Kirakan luas kawasan antara lengkung $y = 10 - x^2$ *dan paksi x antara* $x = -2$ *dan* $x = 2$.



[5 marks]

[*5 markah*]

SOALAN TAMAT

FORMULA SHEET FOR DBM10143: CALCULUS AND ALGEBRA

VECTOR & SCALAR

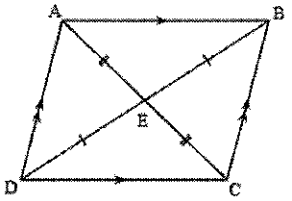
1. ***Magnitude Vector***; $|\vec{A}| = \sqrt{a^2 + b^2 + c^2}$
2. ***Unit Vector***; $\hat{u} = \frac{\overline{u}}{|u|}$
3. ***Cos θ*** = $\frac{\overline{A} \bullet \overline{B}}{|A||B|}$
4. ***Scalar Product;***

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

5. ***Vector Product;***

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

**Formula number 6 & 7, refers to the same diagram*



6. ***Area of parallelogram ABCD;***

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

7. ***Area of triangle ABC;***

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

GEOMETRY

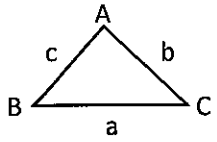
Radian to Degree

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

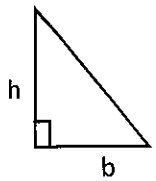
Degree to Radian

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

Formula of triangle



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



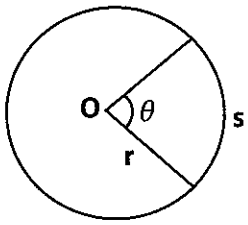
$Area\ of\ right\ angle\ triangle = \frac{1}{2}bh$

Circumference

$circumference = 2\pi r$

Arc Length

$s = r\theta \qquad (\theta\ in\ radian)$



Area of Circle

$A = \pi r^2$

Area of Sector

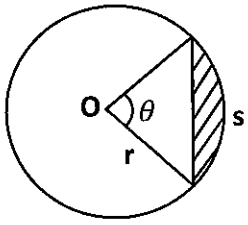
$A = \frac{1}{2}r^2\theta \qquad (\theta\ in\ radian)$

Area of Segment

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

or

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

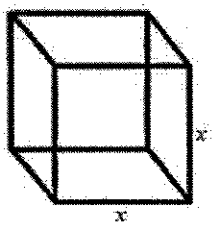


θ_1 *must be in radian*

θ_2 *must be in degree*

Surface area and Volume

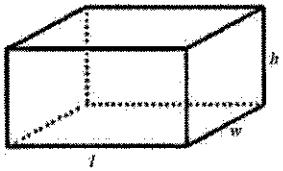
Cube



$A = 6x^2$

$V = x^3$

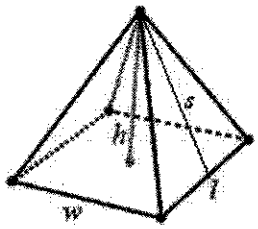
Cuboid



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

$V = lwh$

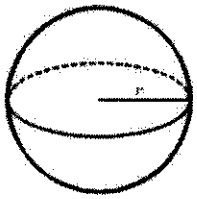
Pyramid



$A = wl + ls + ws$

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

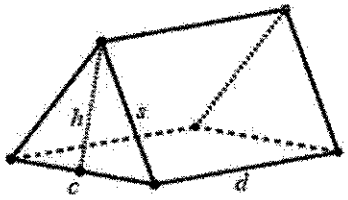
Sphere



$A = 4\pi r^2$

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

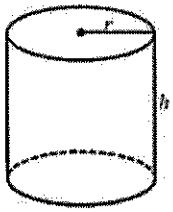
Prism



$A = ch + cd + 2sd$

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

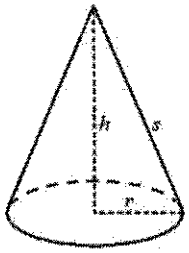
Cylinder



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

$V = \pi r^2 h$

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.	$\frac{d}{dx}(ax+b)^n = n(ax+b)^{n-1} \times \frac{d}{dx}(ax+b)$ [Composite Rule]		
4.	$\frac{d}{dx}\big(f(x) \pm g(x)\big) = f'(x) \pm g'(x)$	5.	$\frac{d}{dx}(uv) = u\frac{dv}{dx} + v\frac{du}{dx}$ [Product Rule]
6.	$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$ [Quotient Rule]	7.	$\frac{dy}{dx} = \frac{du}{dx} \times \frac{dy}{du}$ [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.	$\int_a^b f(x)dx = F(b) - F(a)$