

SULIT



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

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI I : 2022/2023

DBM20023 : ENGINEERING MATHEMATICS 2

TARIKH : 27 DISEMBER 2022

MASA : 8.30 AM – 10.30 AM (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 paper consists of **FOUR (4)** structured questions. Answer **ALL** questions.

ARAHAN:

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

QUESTION 1**SOALAN 1**

CLO1
C3

(a) Express each of the followings in the simplest form:

Nyatakan setiap fungsi yang berikut dalam bentuk paling ringkas:

i. $a^{3x} \times a^{x-2} \div a^{2x}$

[3 marks]

[3 markah]

ii. $3b^3c^4 \div 3b^2c^2$

[3 marks]

[3 markah]

iii. $4^{2x} \times 16^{x-2} \times 64^{1-x}$

[4 marks]

[4 markah]

CLO2
C3

(b) Calculate the following equations using the suitable method:

Kirakan persamaan-persamaan berikut mengikut kaedah yang bersesuaian:

i. $\log_5 6 + \log_5 4x = 0$

[5 marks]

[5 markah]

ii. $3\log_2 8 - \log_2 P = 5$

[5 marks]

[5 markah]

iii. $\log_x 4 + \frac{1}{2}\log_x 16 = 4$

[5 marks]

[5 markah]

QUESTION 2

SOALAN 2

CLO1
C3

(a)

- i. Calculate $\frac{dy}{dx}$ for equation $y = (3x + 8)^8$ by using **chain rule**.

*Kirakan $\frac{dy}{dx}$ untuk persamaan $y = (3x + 8)^8$ dengan menggunakan **petua rantai**.*

[4 marks]

[4 markah]

- ii. Compute the **second derivative** for the function $y = -4x^2 + 5x^3 + \frac{3}{x}$

*Kirakan pembezaan **peringkat kedua** bagi fungsi $y = -4x^2 + 5x^3 + \frac{3}{x}$*

[4 marks]

[4 markah]

- iii. The parametric equations are given as $y = 4e^{(3t+3)}$ and $x = 6 - 3t^2$

Calculate $\frac{dy}{dx}$.

Fungsi persamaan parametrik diberi sebagai $y = 4e^{(3t+3)}$ dan

$x = 6 - 3t^2$. Kirakan $\frac{dy}{dx}$.

[4 marks]

[4 markah]

CLO2
C3(b) Calculate the derivative $\frac{dy}{dx}$ for each of the following equations.*Kira pembezaan $\frac{dy}{dx}$ bagi setiap fungsi berikut.*

i. $y = 2e^{2x^2+1} + 6e^{-3x}$

[3 marks]

[3 markah]

ii. $y = \ln \frac{4}{(6+2x)^5}$

[4 marks]

[4 markah]

iii. $y = (2x^2 + 2x)^2 \tan 6x$

[6 marks]

[6 markah]

QUESTION 3**SOALAN 3**CLO1
C3

(a)

- i. Solve the following integrals
- $\int 4x^3 + 2x^2 - 5 dx$

Selesaikan kamiran berikut $\int 4x^3 + 2x^2 - 5 dx$

[3 marks]

[3 markah]

- ii. Solve the following definite integrals
- $\int_2^3 (3x + 6) dx$

Selesaikan kamiran-kamiran tentu berikut $\int_2^3 (3x + 6) dx$

[3 marks]

[3 markah]

- iii. Solve the following integrals by using substitution method

Selesaikan kamiran berikut dengan menggunakan kaedah penggantian.

$$\int 4 \cos 2x dx$$

[4 marks]

[4 markah]

CLO2
C3

- (b) Solve the following integrals using integration by parts.

Selesaikan kamiran-kamiran berikut menggunakan kamiran bahagian demi bahagian.

- i.
- $\int x^2 \cos x dx$

[7 marks]

[7 markah]

- ii.
- $\int x^2 e^{3x} dx$

[8 marks]

[8 markah]

QUESTION 4**SOALAN 4**CLO2
C3

(a)

- i. If the radius of a circle increases at a rate of 0.3 cms^{-1} , calculate the rate of change of area of the circle when its radius is 8 cm. (Given that area of circle $A = \pi r^2$)

Jika jejari bulatan bertambah pada kadar 0.3 cms^{-1} , hitung kadar perubahan luas bulatan apabila jejarinya ialah 8 cm. (Di beri luas bulatan ialah $A = \pi r^2$)

[5 marks]

[5 markah]

- ii. A curve has the equation $y = 3x^2 + 3x + 4$. Solve the given equation to find the stationary points and their natures.

Sebuah lengkung mempunyai persamaan $y = 3x^2 + 3x + 4$. Selesaikan persamaan tersebut untuk mencari titik pegun dan sifatnya.

[8 marks]

[8 markah]

CLO1
C3

(b)

- i. Given a graph $y^2 = (2 + x)$. Determine the area under the graph bounded by the curve, y-axis, the line $y = 0$ and $y = 3$.

Diberi graf $y^2 = (2 + x)$. Tentukan luas di bawah graf yang dilingkungi oleh lengkungan, paksi -y, garisan $y = 0$ dan $y = 3$.

[6 marks]

[6 markah]

- ii. Refer to Figure 4 (b) ii , calculate the generated volume when this shaded region is rotated 360° around the y-axis.

Merujuk Rajah 4 (b) ii, kira isipadu janaan apabila kawasan berlorek diputarakan 360° pada paksi-y.

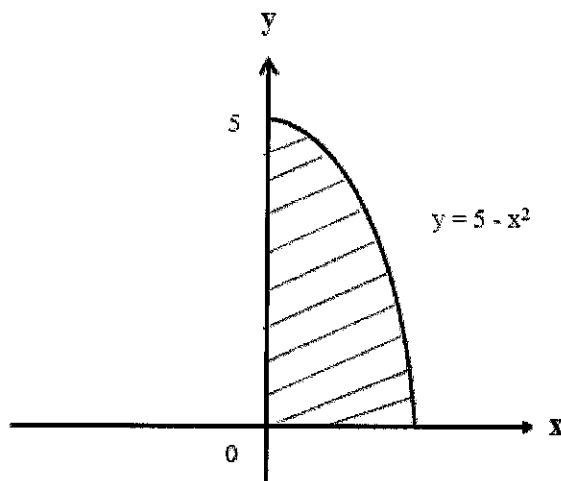


Figure 4 (b) ii / Rajah 4 (b)ii

[6 marks]

[6 markah]

SOALAN TAMAT

FORMULA SHEET FOR DBM20023

EXPONENTS AND LOGARITHMS			
LAW OF EXPONENTS		LAW OF LOGARITHMS	
1.	$a^m \times a^n = a^{m+n}$	8.	$\log_a a = 1$
2.	$\frac{a^m}{a^n} = a^{m-n}$	9.	$\log_a 1 = 0$
3.	$(a^m)^n = a^{m \times n}$	10.	$\log_a b = \frac{\log_c b}{\log_c a}$
4.	$a^0 = 1$	11.	$\log_a MN = \log_a M + \log_a N$
5.	$a^{-n} = \frac{1}{a^n}, a \neq 0$	12.	$\log_a \frac{M}{N} = \log_a M - \log_a N$
6.	$a^{\frac{m}{n}} = (\sqrt[n]{a})^m$	13.	$\log_a N^P = P \log_a N$
7.	$(ab)^n = a^n b^n$	14.	$N = a^x \Leftrightarrow \log_a N = x$

DIFFERENTIATION			
1.	$\frac{d}{dx}(k) = 0, k \text{ is constant}$	2.	$\frac{d}{dx}(ax^n) = anx^{n-1}$ [Power Rule]
3.	$\frac{d}{dx}(ax + b)^n = an(ax + b)^{n-1}$ [Composite Rule]		
4.	$\frac{d}{dx}(f(x) \pm g(x)) = f'(x) \pm g'(x)$	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.	$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$ [Chain Rule]
8.	$\frac{d}{dx}(e^x) = e^x$	9.	$\frac{d}{dx}(e^{ax+b}) = e^{ax+b} \times \frac{d}{dx}(ax + b)$
10.	$\frac{d}{dx}(\ln x) = \frac{1}{x}$	11.	$\frac{d}{dx}[\ln ax + b] = \frac{1}{ax + b} \times \frac{d}{dx}(ax + b)$
12.	$\frac{d}{dx}(\sin x) = \cos x$	13.	$\frac{d}{dx}(\cos x) = -\sin x$

14.	$\frac{d}{dx}(\tan x) = \sec^2 x$	15.	$\frac{d}{dx}[\sin(ax + b)] = \cos(ax + b) \times \frac{d}{dx}(ax + b)$
16.	$\frac{d}{dx}[\cos(ax + b)] = -\sin(ax + b) \times \frac{d}{dx}(ax + b)$	17.	$\frac{d}{dx}[\tan(ax + b)] = \sec^2(ax + b) \times \frac{d}{dx}(ax + b)$
18.	$\frac{d}{dx}[\sin^n u] = n \sin^{n-1} u \times \cos u \times \frac{du}{dx}$	19.	$\frac{d}{dx}[\cos^n u] = n \cos^{n-1} u \times -\sin u \times \frac{du}{dx}$
20.	$\frac{d}{dx}[\tan^n u] = n \tan^{n-1} u \times \sec^2 u \times \frac{du}{dx}$		

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.	$\int_a^b f(x) dx = F(b) - F(a)$
5.	$\int \frac{1}{x} dx = \ln x + c$	6.	$\int \frac{1}{ax + b} dx = \frac{1}{a} \times \ln ax + b + c$
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IDENTITY TRIGONOMETRY			
1.	$\cos^2 \theta + \sin^2 \theta = 1$	2.	$1 + \tan^2 \theta = \sec^2 \theta$
3.	$1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$	4.	$\sin 2\theta = 2 \sin \theta \cos \theta$
5.	$\cos 2\theta = 2 \cos^2 \theta - 1$ $= 1 - 2 \sin^2 \theta$ $= \cos^2 \theta - \sin^2 \theta$	6.	$\tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$
7.	$\tan \theta = \frac{\sin \theta}{\cos \theta}$	8.	$\cot \theta = \frac{\cos \theta}{\sin \theta} = \frac{1}{\tan \theta}$
9.	$\sec \theta = \frac{1}{\cos \theta}$	10.	$\operatorname{cosec} \theta = \frac{1}{\sin \theta}$
AREA UNDER CURVE			
1.	$A_x = \int_a^b y \, dx$	2.	$A_y = \int_a^b x \, dy$
VOLUME UNDER CURVE			
1.	$V_x = \pi \int_a^b y^2 \, dx$	2.	$V_y = \pi \int_a^b x^2 \, dy$
INTEGRATION BY PARTS			
$\int u \, dv = uv - \int v \, du$			

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