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

DBM20173 : ENGINEERING MATHEMATICS 2

TARIKH : 13 MEI 2025
MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas ini mengandungi **TUJUH (7)** 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 section consists of **FOUR (4)** structured questions. Answer **ALL** questions.

ARAHAN:

*Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab semua soalan.*

QUESTION 1

SOALAN 1

CLO1 (a) Simplify each of the following expression below:

Ringkaskan setiap ungkapan berikut:

i. $9^{3m} \times 3^{2m+4} \div 27^{2m+1}$

[5 marks]

[*5 markah*]

ii. $4log_2 p + log_2 q^5 + 3 - log_2 p^2$

[5 marks]

[*5 markah*]

CLO2 (b) Solve the following equations:

Selesaikan persamaan-persamaan berikut:

i. $4^{3x} \times 16^{x-1} = 64$

[5 marks]

[5 *markah*]

ii. $log_2(x+6) = 2 + log_2 3x$

[5 marks]

[5 *markah*]

iii. $2^{log_3(x-8)} = 16$

[5 marks]

[5 *markah*]

QUESTION 2

SOALAN 2

CLO1

(a) Write the derivative $\frac{dy}{dx}$ for the following equations:

Tulis pembezaan $\frac{dy}{dx}$ *bagi persamaan berikut:*

i. $y = 5\sqrt{x} + 4x$

[3 marks]

[*3 markah*]

ii. $y = \frac{x^4 + 4x^3 - 6}{x^2}$

[4 marks]

[*4 markah*]

CLO2

(b) Show the derivative $\frac{dy}{dx}$ for each of the following functions:

Tunjukkan pembezaan $\frac{dy}{dx}$ *bagi setiap fungsi berikut:*

i. $y = sin^2(7x + 5)$

[4 marks]

[4 *markah*]

ii. $y = 5e^{4x}cos3x$

[5 marks]

[5 *markah*]

CLO2 (c) Compute:

Hitungkan:

i. the derivative $\frac{dy}{dx}$ for the parametric equation function given below:

pembezaan $\frac{dy}{dx}$ *bagi fungsi persamaan parametrik seperti di bawah:*

$$x = 9t^2 + 4t^5$$

$$y = 3\ ln\ 6t$$

[4 marks]

[4 *markah*]

ii. the $\frac{\delta z}{\delta x}$, $\frac{\delta z}{\delta y}$, $\frac{\delta^2 z}{\delta y \delta x}$ and $\frac{\delta^2 z}{\delta x \delta y}$ for the function below.

$\frac{\delta z}{\delta x}$, $\frac{\delta z}{\delta y}$, $\frac{\delta^2 z}{\delta y \delta x}$ *dan* $\frac{\delta^2 z}{\delta x \delta y}$ *bagi persamaan di bawah.*

$$z = (2 - 4x)(3y + 2x)$$

[5 marks]

[5 *markah*]

QUESTION 3

SOALAN 3

CLO2 (a) Calculate the stationary point of the curve $y = x^3 - 6x^2 + 9x + 5$ and its nature.

Kirakan titik pegun dan sifatnya bagi lengkungan $y = x^3 - 6x^2 + 9x + 5$.

[10 marks]

[*10 markah*]

CLO2 (b) Solve the following integrals using the substitution method. Given $u = x^2 + 3x + 5$.

Selesaikan kamiran berikut menggunakan kaedah gantian. Diberi $u = x^2 + 3x + 5$.

$$\int_1^2 \frac{2x + 3}{x^2 + 3x + 5} dx$$

[7 marks]

[7 *markah*]

CLO1 (c) Solve the following integrals.

Selesaikan kamiran berikut.

i. $\int (8x + 7)^{\frac{1}{2}} dx$

[3 marks]

[3 *markah*]

ii. $\int_{-1}^{2} 2x(x^2 + 5) dx$

[5 marks]

[5 *markah*]

QUESTION 4

SOALAN 4

CLO2 (a) Solve the following integrals using the integration by parts.

Selesaikan kamiran-kamiran berikut menggunakan kamiran bahagian demi bahagian.

i. $\int xe^{3x}dx$

[4 marks]

[4 *markah*]

ii. $\int 2x^2(4\ sin\ 2x)dx$

[7 marks]

[7 *markah*]

(b)

CLO1 i. Figure 4(b)i shows an enclosed region between the curve of $y = x^2 - 4$ and x-axis between $x = 2$ and $x = 4$. Calculate the area of the shaded region.

Rajah 4(b)i menunjukkan kawasan tertutup antara lengkung $y = x^2 - 4$ *dan paksi-x antara x=2 dan x=4. Kirakan luas kawasan berlorek.*

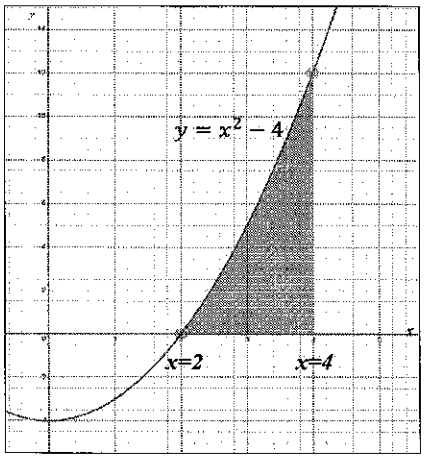

Figure 4(b)i / *Rajah 4(b)i*

[6 marks]

[6 *markah*]

ii. Figure 4(b)ii shows the graph of $x^2 = 3 - y$ between $x = -1$ and $x = 1$. Calculate the volume of the shaded region when it is rotated 360° about x-axis.

Rajah 4(b)ii menunjukkan graf $x^2 = 3 - y$ *antara* $x = -1$ *dan* $x = 1$. *Kirakan isipadu kawasan berlorek apabila diputar 360° pada paksi-x.*

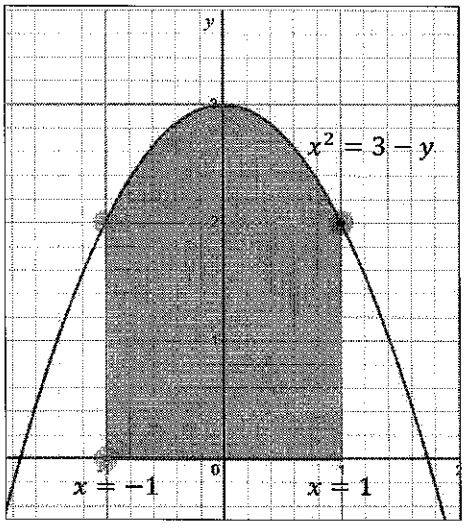

Figure 4(b)ii/ *Rajah 4(b)ii*

[8 marks]

[8 *markah*]

SOALAN TAMAT

FORMULA SHEET FOR DBM20173

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.	$\frac{d}{dx}(ax+b)^n = n(ax+b)^{n-1} \times \frac{d}{dx}(ax+b)$ *[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.	$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$ *[Chain Rule]*
8.	$\frac{d}{dx}(e^x) = e^x$	9.	$\frac{d}{dx}\left(e^{ax+b}\right) = e^{ax+b} \times \frac{d}{dx}(ax+b)$
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.	$\int k\ dx = kx + c, k\ is\ constant$	4.	$\int_a^b f(x)dx = F(b) - F(a)$
5.	$\int \frac{1}{x}\ dx = \ln\ \|x\| + c$	6.	$\int \frac{1}{ax+b}\ dx = \frac{1}{a} \times \ln\ \|ax+b\| + c$
7.	$\int e^x\ dx = e^x + c$	8.	$\int e^{ax+b}\ dx = \frac{1}{a} \times e^{ax+b} + c$
9.	$\int \sin x\ dx = -\cos x + c$	10.	$\int \cos x\ dx = \sin x + c$
11.	$\int sec^2\ x\ dx = \tan x + c$		
12.	$\int \sin(ax+b)\ dx = -\frac{1}{a} \times \cos(ax+b) + c$		
13.	$\int \cos(ax+b)\ dx = \frac{1}{a} \times sin(ax+b)\ + c$		
14.	$\int sec^2(ax+b)\ dx = \frac{1}{a} \times \tan(ax+b) + c$		

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			
$\int u\ dv = uv - \int v\ du$			