SULIT

POLITEKNIK MALAYSIA

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

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI II : 2021/2022

DBM20023: ENGINEERING MATHEMATICS 2

TARIKH : 04 JULAI 2022
MASA : 8.30 PAGI – 10.30 PAGI (2 JAM)

Kertas ini mengandungi **SEMBILAN (9)** 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
C3

(a) Simplify each of the following expressions:

Permudahkan setiap ungkapan yang berikut:

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

[3 marks]

[3 *markah*]

ii. $3\log p + 2\log p - \dfrac{\log p}{4}$

[4 marks]

[4 *markah*]

CLO2
C3

(b) Solve the following equations:

Selesaikan persamaan berikut:

i. $3^{4x+1} \bullet 9^{x-1} = 81$

[4 marks]

[*4 markah*]

ii. $2\log_3 x - \log_9 4 = 0$

[4 marks]

[*4 markah*]

CLO1
C3

(c) Differentiate the following functions:

Bezakan fungsi-fungsi berikut:

i. $y = 5x^2 + \frac{2}{x^4}$

[3 marks]

[*3 markah*]

ii. $y = (7 - 4x^5)^3$

[2 marks]

[2 *markah*]

iii. $y = (x + 2)^3 (2x - 5)^2$

[5 marks]

[5 *markah*]

QUESTION 2

SOALAN 2

CLO1 C3

(a)

i. Given that $z = 3xy + 10x^3y^2 - 5$. Determine:

Diberi $z = 3xy + 10x^3y^2 - 5$. *Tentukan:*

a. $\frac{\partial z}{\partial x}$

[1 mark]

[*1 markah*]

b. $\frac{\partial z}{\partial y}$

[1 mark]

[*1 markah*]

c. $\frac{\partial^2 z}{\partial x \partial y}$

[1 mark]

[*1 markah*]

d. $\frac{\partial^2 z}{\partial x^2}$

[1 mark]

[*1 markah*]

ii. Given that $5y^2 - 3x^3 = 4y$. Determine $\frac{dy}{dx}$.

Diberi $5y^2 - 3x^3 = 4y$. *Tentukan* $\frac{dy}{dx}$

[5 marks]

[*5 markah*]

CLO2
C3

(b) Differentiate the following functions:
Bezakan fungsi yang berikut:

i. $y = \frac{7}{8}\sin(4x+1)$

[3 marks]
[*3 markah*]

ii. $y = 4e^{5x^2}$

[3 marks]
[*3 markah*]

CLO2
C3

(c) Find the stationary point for the function of $y = 2x^3 - 4x^2$. Then determine their nature.
Cari titik pegun bagi fungsi $y = 2x^3 - 4x^2$. *Kemudian tentukan sifat titik-titik tersebut.*

[10 marks]
[*10 markah*]

QUESTION 3

SOALAN 3

CLO1
C3

(a) Solve the following integrals.

Selesaikan setiap kamiran yang berikut.

i. $\int -7 + sec^2 5x \ dx$

[2 marks]

[*2 markah*]

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

[2 marks]

[*2 markah*]

iii. $\int e^{1-3x} + 5x^2 - 8 \ dx$

[3 marks]

[*3 markah*]

iv. $\int \frac{1}{x^2} - \frac{2}{x^3} \ dx$

[3 marks]

[*3 markah*]

CLO2
C3

(b) Solve the following integrals.

Selesaikan setiap kamiran yang berikut.

i. $\int 2x \sin x^2 \ dx$

[4 marks]

[*4 markah*]

ii. $\int xe^{3x^2}\,dx$

[4 marks]

[*4 markah*]

iii. $\int_1^2 \frac{x^2+1}{x^3+3x}\,dx$

[7 marks]

[*7 markah*]

QUESTION 4

SOALAN 4

CLO1
C3

(a) Refer to the Figure 4(a), determine the volume generated when the shaded region rotated 360° on the x-axis.

Merujuk Rajah 4(a), tentukan isipadu janaan apabila kawasan berlorek diputarkan 360° pada paksi-x.

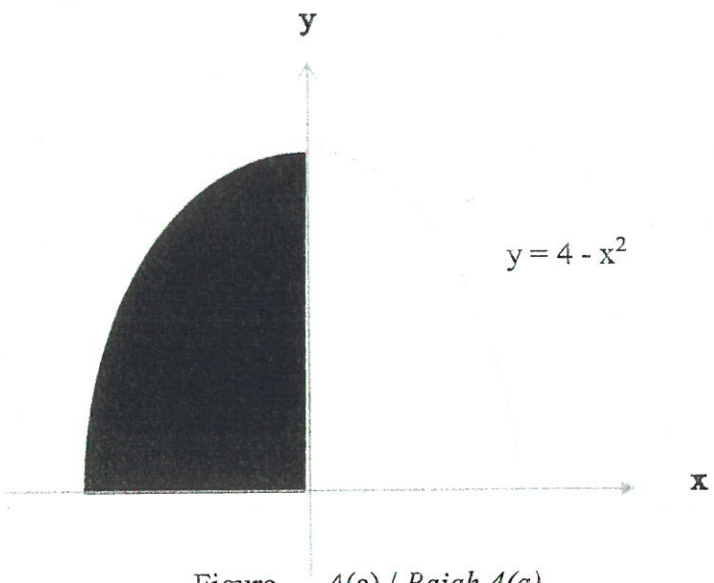


Figure 4(a) / *Rajah 4(a)*

[*12 marks*]

[*12 markah*]

CLO2
C3

(b) Solve the following integrals using by part method:

Selesaikan kamiran-kamiran berikut menggunakan kaedah bahagian demi bahagian:

i. $\int 2x \ln x dx$

[*5 marks*]

[*5 markah*]

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

[8 *marks*]

[*8 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.	$a^{-n} = \frac{1}{a^n}, \quad a \neq 0$	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.	$\frac{d}{dx}\big(f(x) \pm g(x)\big) = f'(x) \pm g'(x)$	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]*
7.	$\frac{d}{dx}(e^x) = e^x$	8.	$\frac{d}{dx}\left(e^{ax+b}\right) = e^{ax+b} \times \frac{d}{dx}(ax+b)$
9.	$\frac{d}{dx}(ln\|x\|) = \frac{1}{x}$	10.	$\frac{d}{dx}[\ln\|ax+b\|] = \frac{1}{ax+b} \times \frac{d}{dx}(ax+b)$
11.	$\frac{d}{dx}(\sin x) = \cos x$	12.	$\frac{d}{dx}(\cos x) = -\sin x$
13.	$\frac{d}{dx}(\tan x) = \sec^2 x$	14.	$\frac{d}{dx}[\sin(ax+b)] = \cos(ax+b) \times \frac{d}{dx}(ax+b)$

15.	$\frac{d}{dx}[\cos(ax+b)] = -\sin(ax+b) \times \frac{d}{dx}(ax+b)$	16.	$\frac{d}{dx}[\tan(ax+b)] = sec^2(ax+b) \times \frac{d}{dx}(ax+b)$
17.	$\frac{d}{dx}[\sin^n u] = n\sin^{n-1} u \times \cos u \times \frac{du}{dx}$	18.	$\frac{d}{dx}[cos^n u] = n\,cos^{n-1} u \times -\sin u \times \frac{du}{dx}$
19.	$\frac{d}{dx}[tan^n u] = n\,tan^{n-1} u \times sec^2 u \times \frac{du}{dx}$	20.	$\frac{d}{dx}(\cot x) = -\text{cosec}^2 x$
21.	$\frac{d}{dx}(\sec x) = \sec x\, tan\, x$	22.	$\frac{d}{dx}(\text{cosec}\, x) = -\text{cosec}\, x\ cot\, x$

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.	$\int \frac{1}{x}\ dx = \ln\ \lvert x\rvert + c$	6.	$\int \frac{1}{ax+b}\ dx = \frac{1}{a} \times \ln\ \lvert ax+b\rvert + c$
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.	$\int sec^2(ax+b)\ dx = \frac{1}{a} \times \tan(ax+b) + c$		

IDENTITY TRIGONOMETRY			
1.	$cos^2\theta + sin^2\theta = 1$	2.	$1 + tan^2\theta = sec^2\theta$
3.	$1 + cot^2\theta = cosec^2\theta$	4.	$\sin 2\theta = 2\sin\theta\cos\theta$
5.	$\cos 2\theta = 2cos^2\theta - 1$ $= 1 - 2sin^2\theta$ $= cos^2\theta - sin^2\theta$	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.	$cosec\,\theta = \frac{1}{\sin\theta}$
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			
$\int u\,dv = uv - \int v\,du$			