

**SULIT**



**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 : 08.30 PAGI – 10.30 PAGI (2 JAM)**

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Kertas ini mengandungi **ENAM (6)** halaman bercetak.  
Struktur (4 soalan)  
Dokumen sokongan yang disertakan : Formula

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**JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN**

(CLO yang tertera hanya sebagai rujukan)

**SULIT**

**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 followings as a single fraction in the simplest forms.  
*Permudahkan setiap sebutan berikut sebagai pecahan tunggal dalam ungkapan termudah.*

i. 
$$\frac{2^{n+4} \times 4 \times 2^{n-1}}{2^n}$$

[4 marks]

[4 markah]

ii. 
$$\log_7 5 - 1 + \log_7 6$$

[3 marks]

[3 markah]

CLO2  
C3

- b) Evaluate the values of x for the following equations.  
*Dapatkan nilai x bagi persamaan di bawah.*

i. 
$$3^{4x} = \frac{27^{x+2}}{9^x}$$

[4 marks]

[4 markah]

CLO1  
C3

ii.  $\log_3(5x - 3) - \log_3 3x = 1$

[4 marks]

[4 markah]

c) Differentiate the following functions with respect to  $x$ .*Bezakan fungsi berikut berkenaan dengan  $x$ .*

i.  $y = 5x^4 - x + \frac{4}{x^3}$

[3 marks]

[3 markah]

ii.  $y = (x + 2)(2 - 3x)$

[3 marks]

[3 markah]

iii.  $y = \sqrt{10x + 3}$

[4 marks]

[4 markah]

**QUESTION 2****SOALAN 2**CLO1  
C3

a) Determine the second order differentiation for the following function:

*Tentukan pembezaan peringkat kedua bagi fungsi y berikut:*

i.  $y = e^{\pi x}$

[3 marks]

[3 markah]

ii.  $y = \ln (\cos x)$

[6 marks]

[6 markah]

CLO2  
C3

b) Find the derivative for each of the following.

*Cari pembezaan bagi setiap fungsi berikut.*

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

[2 marks]

[2 markah]

ii.  $y = \frac{x}{(\cos 2x)}$

[4 marks]

[4 markah]

CLO2  
C3c) Find the stationary points for equation  $y = 2x^3 - x^2 + 2$ . Then, determine the maximum and minimum point.*Cari titik-titik pegun bagi persamaan  $y = 2x^3 - x^2 + 2$ . Kemudian, tentukan titik maksimum dan titik minimum.*

[10 marks]

[10 markah]

## QUESTION 3

## SOALAN 3

CLO1  
C3

- a) Solve the following equations by using the suitable method.  
*Selesaikan persamaan berikut dengan menggunakan kaedah yang bersesuaian.*

i.  $\int -3\sqrt[4]{x} dx$

[3 marks]

[3 markah]

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

[3 marks]

[3 markah]

iii.  $\int_{-1}^2 4x + x^2 dx$

[4 marks]

[4 markah]

CLO 2  
C3

- b) Integrate the functions below.  
*Kamirkan fungsi-fungsi di bawah.*

i.  $\int_2^3 \frac{7}{x} + x^{-1} dx$

[5 marks]

[5 markah]

ii.  $\int_0^1 7e^{3x} - \frac{e^{5x}}{e^{2x}} dx$

[5 marks]

[5 markah]

iii.  $\int 2x^3 \sin x^4 dx$

[5 marks]

[5 markah]

**QUESTION 4****SOALAN 4**CLO1  
C3

- a) i. By using partial fraction, determine:

*Dengan menggunakan pecahan separa, tentukan:*

$$\int \frac{2x}{(x+4)(x-5)} dx$$

[6 marks]

[6 markah]

- ii. Given a graph
- $y^2 = x^2 + 6$
- . Find the area under the graph bounded by the curve, y-axis, the lines
- $y = 12$
- and
- $y = 16$
- .

*Diberi graf  $y^2 = x^2 + 6$ . Carikan luas di bawah graf yang dilingkungi oleh lengkungan, paksi-y, garisan  $y = 12$  dan  $y = 16$ .*

[6 marks]

[6 markah]

CLO2  
C3

- b) By using integration by parts, calculate:

*Dengan menggunakan kamiran bahagian demi bahagian, kirakan:*

i.  $\int_1^4 \frac{1}{x^3} \ln 6x \, dx$

[6 marks]

[6 markah]

ii.  $\int x^2 \sin x \, dx$

[7 marks]

[7 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.	$\frac{d}{dx}(f(x) \pm g(x)) = f'(x) \pm g'(x)$	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]
7.	$\frac{d}{dx}(e^x) = e^x$	8.	$\frac{d}{dx}(e^{ax+b}) = e^{ax+b} \times \frac{d}{dx}(ax+b)$
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.	$\frac{d}{dx} (\cot x) = -\operatorname{cosec}^2 x$
21.	$\frac{d}{dx} (\sec x) = \sec x \tan x$	22.	$\frac{d}{dx} (\operatorname{cosec} x) = -\operatorname{cosec} x \cot x$

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.	$\int k dx = kx + c, k \text{ is constant}$	4.	$\int_a^b f(x) dx = F(b) - F(a)$
5.	$\int \frac{1}{x} dx = \ln  x  + c$	6.	$\int \frac{1}{ax + b} dx = \frac{1}{a} \times \ln  ax + b  + c$
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.	$1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$	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.	$A_y = \int_a^b x \, dy$
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**VOLUME UNDER CURVE**

1.	$V_x = \pi \int_a^b y^2 \, dx$	2.	$V_y = \pi \int_a^b x^2 \, dy$
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**INTEGRATION BY PARTS**

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