



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 DAN KOMPUTER

PEPERIKSAAN AKHIR

SESI II : 2025/2026

DBM20023: ENGINEERING MATHEMATICS 2

TARIKH : 2 MEI 2026

MASA : 8.30 PAGI – 10.30 PAGI (2 JAM)

Kertas soalan 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)

TERBUKA

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) Show each of the following expression in the simplest form.

Tunjukkan setiap ungkapan berikut dalam bentuk yang paling ringkas.

i.
$$\frac{18x^5y^3}{3x^3y^3}$$

[2 marks]

[2 markah]

ii.
$$9^{3x} \times 729^2 \div 81^{2x}$$

[4 marks]

[4 markah]

iii.
$$4\log_2 x - \log_2 \sqrt{x} + \log_2 5$$

[4 marks]

[4 markah]

TERBUKA

CLO2

(b) Solve the following equations.

Selesaikan persamaan berikut.

i. $3^{3x} \times 9^{x-2} = 3^x$

[5 marks]

[5 markah]

ii. $7^{3x} = 50$

[5 marks]

[5 markah]

iii. $3 \log_2 8 - \log_2 x = 5$

[5 marks]

[5 markah]

TERBUKA

QUESTION 2

SOALAN 2

CLO1

(a)

- i. Calculate the derivative $\frac{dy}{dx}$ for equation $y = 6x^4 - \frac{3}{x^2}$

Kirakan pembezaan $\frac{dy}{dx}$ bagi persamaan $y = 6x^4 - \frac{3}{x^2}$

[3 marks]

[3 markah]

- ii. Compute the first order partial differentiation, $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ for equation

$$z = 2xy - 3y + 2x^4.$$

Hitungkan pembezaan separa peringkat pertama, $\frac{\partial z}{\partial x}$ dan $\frac{\partial z}{\partial y}$ bagi

persamaan $z = 2xy - 3y + 2x^4$

[4 marks]

[4 markah]

- iii. Calculate the second order differentiation for the equation

$$y = \sqrt{4x + 3}$$

Kirakan pembezaan peringkat kedua bagi persamaan

$$y = \sqrt{4x + 3}$$

[5 marks]

[5 markah]

TERBUKA

CLO2 (b) Calculate the derivative $\frac{dy}{dx}$ for the following equations.

Kira pembezaan $\frac{dy}{dx}$ bagi setiap persamaan berikut.

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

[4 marks]

[4 markah]

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

[4 marks]

[4 markah]

iii. $y = 3 \cos(5x^2 - 1)$ [Use Chain Rule]

[5 marks]

[5 markah]

TERBUKA

QUESTION 3

SOALAN 3

CLO2

- (a) Calculate the stationary points of the equation $y = 3 + 2x - x^2$. Determine their nature and sketch the graph.

Kirakan titik-titik pegun bagi persamaan $y = 3 + 2x - x^2$. Tentukan sifatnya dan lakarkan graf.

[10 marks]

[10 markah]

CLO1

- (b) Solve the following integrals.
Selesaikan pengamiran berikut.

i. $\int_1^3 (x^3 - 5x^2 - 6) dx$

[5 marks]

[5 markah]

ii. $\int (4x + 1)^4 dx$ [Use Substitution Method]

[5 marks]

[5 markah]

iii. $\int \frac{2 + 3e^{3x}}{e^x} dx$

[5 marks]

[5 markah]

TERBUKA

QUESTION 4**SOALAN 4**

CLO2 (a) Solve the following integrals using the methods of Integration by Parts.

Selesaikan pengamiran berikut menggunakan kaedah bahagian demi bahagian

i. $\int 4xe^{2x} dx$

[5 marks]

[5 markah]

ii. $\int x \cos 3x dx$

[5 marks]

[5 markah]

TERBUKA

CLO1

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

Rajah 4 (b) i menunjukkan kawasan antara lengkung $y = x^2 - 2x$ dan paksi- x , dibatasi oleh $x = -2$ dan $x = 4$. Kirakan luas kawasan yang berlorek.

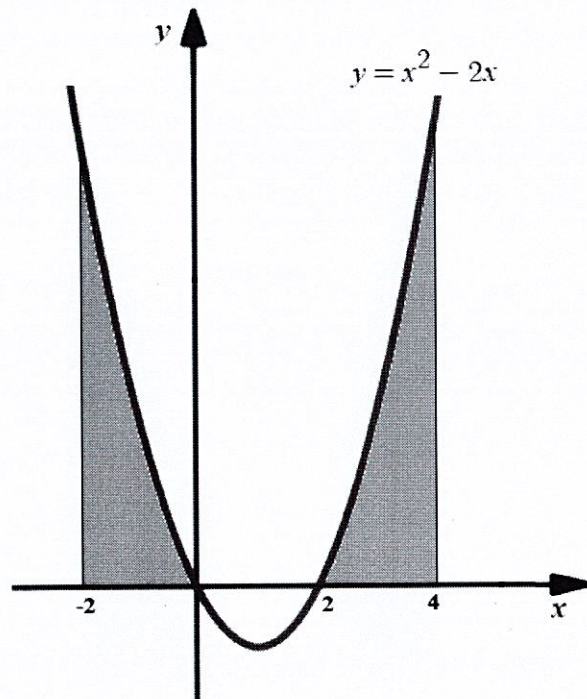


Figure 4 (b) i / Rajah 4 (b) i

TERBUKA

[8 marks]

[8 markah]

- ii. Figure 4 (b) ii shows a region bounded by the line $y = x + 2$ and the curve of $y = x^2$. Calculate the volume when the shaded area is rotated 360° about x -axis.

Rajah 4 (b) ii menunjukkan kawasan yang dibatasi garis $y = x + 2$ dan lengkung $y = x^2$. Kira isipadu apabila kawasan berlorek diputarkan 360° pada paksi- x .

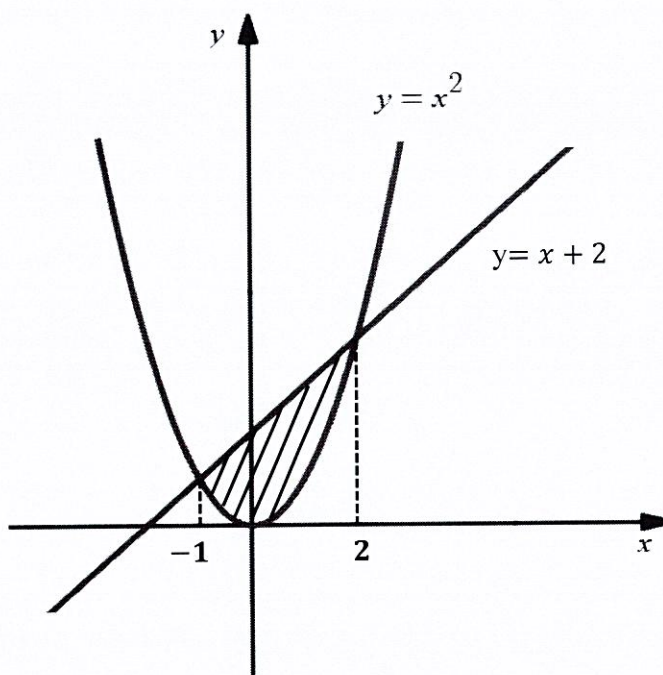


Figure 4 (b) ii / Rajah 4 (b) ii

TERBUKA

[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.	$a^{-n} = \frac{1}{a^n}, a \neq 0$	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.	$\int \frac{1}{ax + b} dx = \frac{1}{a} \times \ln ax + b + c$
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.	$A_y = \int_a^b x \, dy$
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			
$\int u \, dv = uv - \int v \, du$			