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 I : 2025/2026

DBM20173: ENGINEERING MATHEMATICS 2

TARIKH : 01 DISEMBER 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:

Permudahkan setiap ungkapan yang berikut:

i. $\dfrac{5^{n-4}}{25^{3n} \times 125^{2n-1}}$

[5 marks]
[*5 markah*]

ii. $2 + 4\log_8 p - 2\log_8 q + \dfrac{1}{3}\log_8 p$

[5 marks]
[*5 markah*]

CLO2   b)   Calculate the following equations:

Kirakan persamaan-persamaan berikut:

i. $3^{5-x} = 81\sqrt{3}$

[4 marks]
[*4 markah*]

ii. $4^{2x+1} = 5$

[5 marks]
[*5 markah*]

iii. $\log_5 x = \log_{25}(3 - 2x^2)$

[6 marks]
[*6 markah*]

QUESTION 2
SOALAN 2

CLO1   a)   Write the derivative $\frac{dy}{dx}$ for the following equations:

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

i. $y = \frac{3}{4}x^4 - \frac{5}{x^2} + \sqrt{6}$

[3 marks]
[3 markah]

ii. $y = x^2\left(7x - \frac{4}{x^4} + 3\right)$

[4 marks]
[4 markah]

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

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

i. $y = \cos^2 4x^4$

[4 marks]
[4 markah]

ii. $y = 5x^3 \ln(3x + 6)$

[5 marks]
[5 markah]

CLO2   c)   Compute:

Hitungkan:

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

pembezaan $\frac{dy}{dx}$ bagi fungsi persamaan parametrik yang diberikan:

$$y = 5 \ln 5t$$
$$x = 4t^5 - 5t^3$$

[4 marks]

[*4 markah*]

    ii. $\frac{\partial z}{\partial x}, \ \frac{\partial z}{\partial y}, \ \frac{\partial^2 z}{\partial y^2}$ and $\frac{\partial^2 z}{\partial x \partial y}$ for function $z = (8x + 3y)(7x + 5y)$.

$\frac{\partial z}{\partial x}, \ \frac{\partial z}{\partial y}, \ \frac{\partial^2 z}{\partial y^2}$ *dan* $\frac{\partial^2 z}{\partial x \partial y}$ *bagi fungsi* $z = (8x + 3y)(7x + 5y)$.

[5 marks]

[*5 markah*]

QUESTION 3
SOALAN 3

CLO2   a)   Calculate the stationary points of the equation $y = 4x^3 - 3x^2 + 3$, then determine their nature of the point.

Kirakan titik-titik pegun bagi persamaan $y = 4x^3 - 3x^2 + 3$, seterusnya tentukan sifatnya.

[10 marks]

[*10 markah*]

CLO2   b)   Solve the following integrals by using substitution method:

Selesaikan kamiran berikut dengan menggunakan kaedah penggantian:

   i. $\int 8xe^{4x^2-1} \, dx$; given $u = 4x^2 - 1$

[4 marks]

[*4 markah*]

   ii. $\int 3x^2 \sec^2 x^3 \, dx$; given $u = x^3$

[4 marks]

[*4 markah*]

CLO1   c)   Solve the following integrals:

Selesaikan kamiran berikut:

   i. $\int \frac{x^3}{2} - x + \frac{7}{x^5} \, dx$

[3 marks]

[*3 markah*]

   ii. $\int_0^1 (x + 6)(1 + x) \, dx$

[4 marks]

[*4 markah*]

QUESTION 4
SOALAN 4

CLO2   a)   Solve the following integrals by using integrations by parts.

Selesaikan kamiran berikut menggunakan kamiran bahagian demi bahagian.

     i. $\int \frac{x^2}{2} \ln x \ dx$

[5 marks]
[*5 markah*]

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

[5 marks]
[*5 markah*]

CLO1   b)

     i.   Figure 4b(i) shows an enclosed region between the curve and x–axis of $y = 3\sqrt{x}$ where $x = 1$ and $x = 4$. Calculate the shaded area.

Rajah 4b(i) menunjukkan kawasan tertutup bagi lengkung dan paksi- x bagi $y = 3\sqrt{x}$ di mana x =1 dan x =4. Hitungkan luas kawasan berlorek.
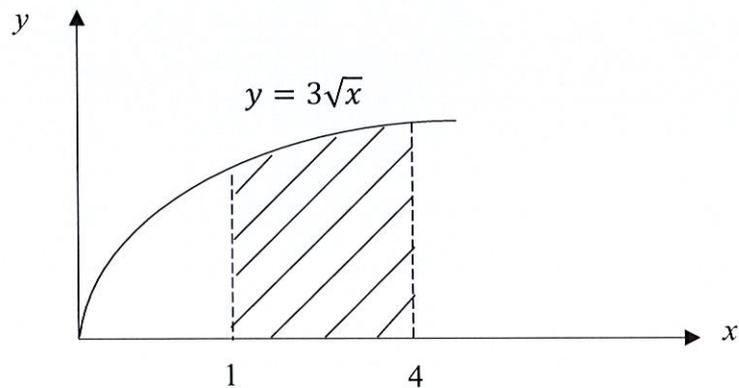

Figure 4b(i) / *Rajah 4b(i)*

[7 marks]
[*7 markah*]

ii.   Figure 4b(ii) shows an enclosed region between the curve and y–axis of $x = y^2 - 2$ where $y = 0$ and $y = 1$. Calculate the volume of bounded region when it is rotated $360°$ at y-axis.

Rajah 4b(ii) menunjukkan kawasan tertutup bagi lengkung dan paksi-y bagi $x = y^2 - 2$ di mana $y = 0$ dan $y = 1$. Hitungkan isipadu kawasan berlorek apabila diputar $360°$ pada paksi $- y$.
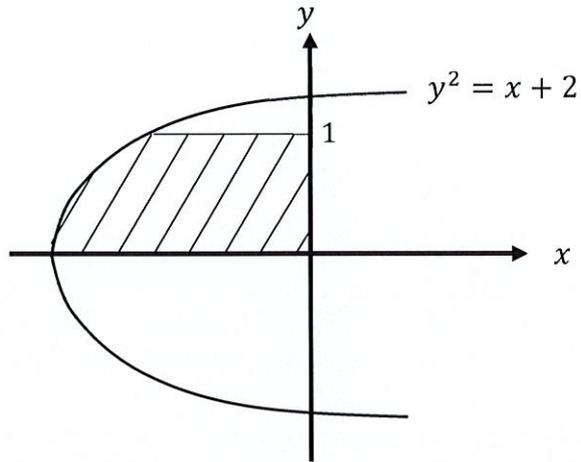

Figure 4b(ii) / *Rajah 4b(ii)*

[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. $\dfrac{a^m}{a^n} = a^{m-n}$	9. $\log_a 1 = 0$
3. $(a^m)^n = a^{m \times n}$	10. $\log_a b = \dfrac{\log_c b}{\log_c a}$
4. $a^0 = 1$	11. $\log_a MN = \log_a M + \log_a N$
5. $a^{-n} = \dfrac{1}{a^n}$, $a \neq 0$	12. $\log_a \dfrac{M}{N} = \log_a M - \log_a N$
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. $\dfrac{d}{dx}(k) = 0, k \text{ is constant}$	2. $\dfrac{d}{dx}(ax^n) = anx^{n-1}$ [Power Rule]
3. $\dfrac{d}{dx}(ax+b)^n = n(ax+b)^{n-1} \times \dfrac{d}{dx}(ax+b)$ [Composite Rule]	
4. $\dfrac{d}{dx}\big(f(x) \pm g(x)\big) = f'(x) \pm g'(x)$	5. $\dfrac{d}{dx}(uv) = u\dfrac{dv}{dx} + v\dfrac{du}{dx}$ [Product Rule]
6. $\dfrac{d}{dx}\left(\dfrac{u}{v}\right) = \dfrac{v\dfrac{du}{dx} - u\dfrac{dv}{dx}}{v^2}$ [Quotient Rule]	7. $\dfrac{dy}{dx} = \dfrac{dy}{du} \times \dfrac{du}{dx}$ [Chain Rule]
8. $\dfrac{d}{dx}(e^x) = e^x$	9. $\dfrac{d}{dx}(e^{ax+b}) = e^{ax+b} \times \dfrac{d}{dx}(ax+b)$
10. $\dfrac{d}{dx}(\ln|x|) = \dfrac{1}{x}$	11. $\dfrac{d}{dx}[\ln|ax+b|] = \dfrac{1}{ax+b} \times \dfrac{d}{dx}(ax+b)$
12. $\dfrac{d}{dx}(\sin x) = \cos x$	13. $\dfrac{d}{dx}(\cos x) = -\sin x$
14. $\dfrac{d}{dx}(\tan x) = \sec^2 x$	15. $\dfrac{d}{dx}[\sin(ax+b)] = \cos(ax+b) \times \dfrac{d}{dx}(ax+b)$
16. $\dfrac{d}{dx}[\cos(ax+b)] = -\sin(ax+b) \times \dfrac{d}{dx}(ax+b)$	17. $\dfrac{d}{dx}[\tan(ax+b)] = \sec^2(ax+b) \times \dfrac{d}{dx}(ax+b)$
18. $\dfrac{d}{dx}[\sin^n u] = n\sin^{n-1} u \times \cos u \times \dfrac{du}{dx}$	19. $\dfrac{d}{dx}[\cos^n u] = n\cos^{n-1} u \times -\sin u \times \dfrac{du}{dx}$
20. $\dfrac{d}{dx}[\tan^n u] = n\tan^{n-1} u \times \sec^2 u \times \dfrac{du}{dx}$	

	INTEGRATION		
1.	$\int ax^n dx = \dfrac{ax^{n+1}}{n+1} + c;\ \{n \neq -1\}$	2.	$\int (ax+b)^n dx = \dfrac{(ax+b)^{n+1}}{(a)(n+1)} + c;\ \{n \neq -1\}$
3.	$\int k\ dx = kx + c,\ k\text{ is constant}$	4.	$\int_a^b f(x)dx = F(b) - F(a)$
5.	$\int \dfrac{1}{x}\ dx = \ln|x| + c$	6.	$\int \dfrac{1}{ax+b}\ dx = \dfrac{1}{a} \times \ln|ax+b| + c$
7.	$\int e^x\ dx = e^x + c$	8.	$\int e^{ax+b}\ dx = \dfrac{1}{a} \times e^{ax+b} + c$
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.	$\int \sin(ax+b)\ dx = -\dfrac{1}{a} \times \cos(ax+b) + c$		
13.	$\int \cos(ax+b)\ dx = \dfrac{1}{a} \times \sin(ax+b) + c$		
14.	$\int \sec^2(ax+b)\ dx = \dfrac{1}{a} \times \tan(ax+b) + c$		

	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		

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