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

DBM20173: ENGINEERING MATHEMATICS 2

TARIKH : 02 MEI 2026
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)** questions. Answers **ALL** questions.

ARAHAN:

*Bahagian ini mengandungi **EMPAT (4)** soalan. Jawab **SEMUA** soalan.*

QUESTION 1

SOALAN 1

CLO1 (a) Simplify each of the following expressions below.

Ringkaskan setiap ungkapan berikut.

i. $5^{n+4} \times 25(5^n) \div 5^{n+2}$

[5 marks]

[*5 markah*]

ii. $2\log_a 3 + \log_a(3a) - 3$

[5 marks]

[*5 markah*]

CLO2 (b) Solve the following equations:

Selesaikan persamaan-persamaan berikut:

i. $16^{x-1} = \frac{1}{256^{x+2}}$

[5 marks]

[*5 markah*]

ii. $\log_2(6-x) = 2 - \log_2 3$

[5 marks]

[*5 markah*]

iii. $5^{x+1} = 12$

[5 marks]

[*5 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. $y = 3x^2 - \frac{5}{x} + \sqrt{2}$

[3 marks]

[*3 markah*]

ii. $y = 4x^2(-2x + 5)$

[4 marks]

[*4 markah*]

CLO2 (b) Show the derivative $\frac{dy}{dx}$ for each of the following equations:

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

i. $y = \frac{1}{12}\cos(3x^4 + 6)$

[4 marks]

[*4 markah*]

ii. $y = e^{-x}\tan(7x)$

[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 dibawah:*

$$x = \frac{1}{t}$$

$$y = 2 + \ln t$$

[4 marks]

[*4 markah*]

ii. the first order and second order of partial differentiation, $\frac{\partial z}{\partial x}$, $\frac{\partial z}{\partial y}$, $\frac{\partial^2 z}{\partial y \partial x}$ and $\frac{\partial^2 z}{\partial x \partial y}$ for the function below.

pembezaan separa peringkat pertama dan kedua, $\frac{\partial z}{\partial x}$, $\frac{\partial z}{\partial y}$, $\frac{\partial^2 z}{\partial y \partial x}$ *dan* $\frac{\partial^2 z}{\partial x \partial y}$ *bagi persamaan di bawah.*

$$z = x^2 y - 7\sqrt{y} + 9$$

[*5* marks]

[*5 markah*]

QUESTION 3

SOALAN 3

CLO2 (a) Calculate the stationary points of the equation $y = x^3 - 9x^2 + 24x - 13$, then determine their nature of the point.

Kirakan titik pegun bagi persamaan $y = x^3 - 9x^2 + 24x - 13$, *seterusnya tentukan sifatnya.*

[10 marks]

[*10 markah*]

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

Selesaikan kamiran berikut dengan menggunakan kaedah penggantian:

i. $\int 6x \cdot \cos\ (3x^2 + 5)\ dx$

[4 marks]

[*4 markah*]

ii. $\int 5x^2\, e^{x^3}\, dx$

[4 marks]

[*4 markah*]

CLO1 (c) Solve the following integrals:

Selesaikan kamiran berikut:

i. $\int \left(\frac{x^3}{6} + 2\right) dx$

[3 marks]

[*3 markah*]

ii. $\int_{-2}^{2} (3x - 5)(2 + 4x) dx$

[4 marks]

[*4 markah*]

QUESTION 4

SOALAN 4

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

Selesaikan kamiran berikut menggunakan kamiran bahagian demi bahagian.

i. $\int x \cos 2x \, dx$

[5 marks]

[*5 markah*]

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

[5 marks]

[*5 markah*]

(b)

i. Figure 4b(i) shows an enclosed region between the curve of $y = x(x + 2)$ and x – axis between $x = -2$ and $x = 0$. Calculate the area of the shaded region.

Rajah 4(b)i menunjukkan kawasan tertutup antara lengkung $y = x(x + 2)$ *dan paksi-x antara* $x = -2$ *dan* $x = 0$. *Hitungkan luas kawasan berlorek.*

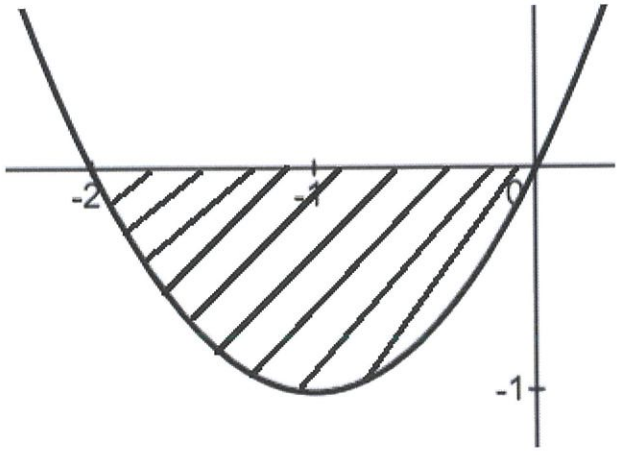

Figure 4(b)i / *Rajah 4(b)i*

[7 marks]

[*7 markah*]

ii. Figure 4b(ii) shows an enclosed region between the curve and y-axis of $x = \sqrt{2y+1}$ 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 $x = \sqrt{2y+1}$ *di mana* $y = 0$ *dan* $y = 1$. *Hitungkan isipadu kawasan berlorek apabila diputar* $360°$ *pada paksi-y.*

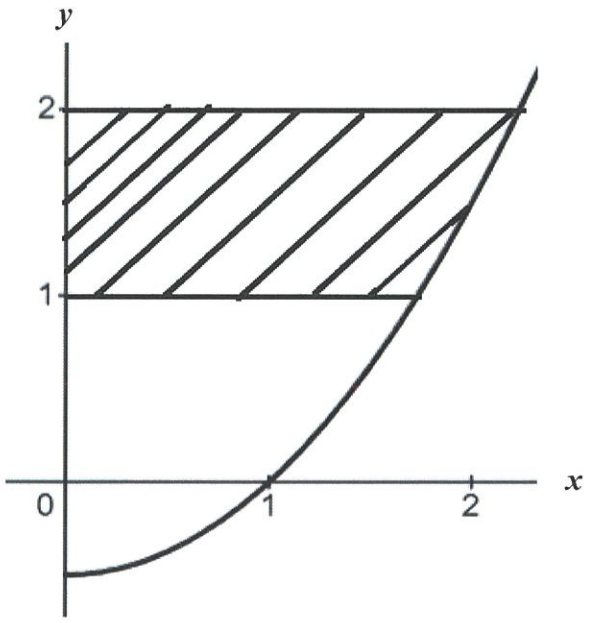

Figure 4(b)ii / *Rajah 4(b)ii*

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

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