

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN MALAYSIA**

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI JUN 2018

DBM2013: ENGINEERING MATHEMATICS 2

TARIKH : 03 NOVEMBER 2018

MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas ini mengandungi **LAPAN (8)** halaman bercetak.

Bahagian A: Struktur (1 soalan)

Bahagian B: Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

SECTION A: 25 MARKS

BAHAGIAN A: 25 MARKAH

INSTRUCTION:

This section consists of **ONE (1)** structured question that **MUST** be answered.

ARAHAN:

Bahagian ini mengandungi **SATU (1)** soalan berstruktur yang **WAJIB** dijawab.

QUESTION 1

SOALAN 1

CLO1
C2

(a) Express each of the following expressions in the simplest form:

Nyatakan setiap ungkapan yang berikut dalam bentuk paling ringkas:

i.
$$\frac{2^{4n} \times 2^{5n}}{4^{6n}}$$

[2 marks]

[2 markah]

ii.
$$\frac{1}{2} \log_x 16 - \log_x 4 - 3 \log_x 2$$

[4 marks]

[4 markah]

iii.
$$\frac{75^{p+2}}{3^{3-p} \times 15^{2p+1} \times 5^2}$$

[4 marks]

[4 markah]

CLO1
C3

(b) Solve the following equations using the suitable method:

Selesaikan persamaan –persamaan berikut mengikut kaedah yang bersesuaian:

i.
$$\log_3(3x + 1) - \log_3(x - 7) = 4$$

[5 marks]

[5 markah]

ii. $2^x + 8(2^{-x}) = 9$

[5 marks]

[5 markah]

iii. Given $\log_5 3 = 0.6826$ and $\log_5 7 = 1.2091$, calculate the value of

$$\log_3 7 + \log_5 \sqrt{7} - \log_5 9$$

Diberi $\log_5 3 = 0.6826$ dan $\log_5 7 = 1.2091$, kirakan nilai bagi

$$\log_3 7 + \log_5 \sqrt{7} - \log_5 9$$

[5 marks]

[5 markah]

SECTION B: 75 MARKS

BAHAGIAN B: 75 MARKAH

INSTRUCTION:

This section consists of **FOUR (4)** structured questions. Answer **THREE (3)** questions only.

ARAHAN:

Bahagian ini mengandungi EMPAT (4) soalan berstruktur. Jawab TIGA (3) soalan sahaja.

QUESTION 2

SOALAN 2

CLO2
C2

(a) Differentiate the following equations:

Bezakan persamaan-persamaan berikut

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

[2 marks]

[2 markah]

ii. $y = \frac{x^2 - 7x + 2}{x^3}$

[3 marks]

[3 markah]

iii. $y = (x^2 - 4)(2x^3 + x)$

[5 marks]

[5 markah]

CLO2
C3

(b) Differentiate the following using the suitable method.

Bezakan yang berikut menggunakan kaedah yang sesuai.

i. $y = x^4 \tan x$

[4 marks]

[4 markah]

ii. $y = (2x - 1)(8x + 2)^2$

[5 marks]

[5 *markah*]

iii. $y = \frac{e^{3x}}{(x+5)^2}$

[6 marks]

[6 *markah*]

QUESTION 3

SOALAN 3

CLO2
C2

- (a) Differentiate the following equations:
Bezakan persamaan – persamaan berikut:

i. $6x^3 - y^2 = 1$

[4 marks]

[4 markah]

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

[6 marks]

[6 markah]

CLO2
C3

(b)

- i. Given $z = 3x^2y^2 + x \cos 2y$. Calculate $\frac{\partial z}{\partial x}$, $\frac{\partial z}{\partial y}$, $\frac{\partial^2 z}{\partial x^2}$ and $\frac{\partial^2 z}{\partial x \partial y}$

Diberi $z = 3x^2y^2 + x \cos 2y$. Kirakan $\frac{\partial z}{\partial x}$, $\frac{\partial z}{\partial y}$, $\frac{\partial^2 z}{\partial x^2}$ dan $\frac{\partial^2 z}{\partial x \partial y}$

[8 marks]

[8 markah]

- ii. Given $z = 18 - 5x^3y^2 - 2y^3$. Find the total differential of z , dz if (x,y) change from $(0.2, 0.5)$ to $(0.25, 0.6)$.

Diberi $z = 18 - 5x^3y^2 - 2y^3$. Cari pembezaan keseluruhan bagi z , dz jika (x,y) berubah dari $(0.2, 0.5)$ ke $(0.25, 0.6)$.

[7 marks]

[7 markah]

QUESTION 4

SOALAN 4

CLO2
C2

(a) Determine the following integrals:

Tentukan kamiran bagi yang berikut:

i. $\int \frac{4x^7}{7x^4} dx$

[3 marks]

[2 markah]

ii. $\int 9 + e^{2x} - \frac{5}{x^3} dx$

[3 marks]

[2 markah]

iii. $\int 2x^3 \sqrt{x^4} dx$

[5 marks]

[5 markah]

CLO2
C3

(b) Solve each of the following integrals:

Selesaikan setiap kamiran yang berikut:

i. $\int 3\cot(5x) dx$

[5 marks]

[5 markah]

ii. $\int_1^3 \frac{1}{2x^3} dx$

[5 marks]

[5 markah]

iii. $\int_0^1 \frac{2}{(2x+5)} dx$

[5 marks]

[5 markah]

QUESTION 5

SOALAN 5

CLO2
C2

(a) Find:

Carikan:

i. $\int \frac{x}{x^2+6x+8} dx$

[Using partial fraction expansion]

[Guna kembangan pecahan separa]

[5 marks]

[5 markah]

ii. $\int \frac{1}{x\sqrt{81x^2-16}} dx$

[5 marks]

[5 markah]

CLO2
C3(b) Find the point of intersection between 2 curves $y = x^2 - 4x + 5$ and $y = 4x - 2x^2$. Find the area bounded by both curves.*Carikan koordinat titik persilangan bagi garis lengkung $y = x^2 - 4x + 5$ dan* *$y = 4x - 2x^2$. Cari luas yang dibatasi oleh kedua-dua garis lengkung tersebut.*

[15 marks]

[15 markah]

SOALAN TAMAT

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.	$\frac{a^m}{a^n} = (\sqrt[n]{a})^m$	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.	$\frac{d}{dx}(x^n) = nx^{n-1}$ [Power Rule]
3.	$\frac{d}{dx}(ax^n) = anx^{n-1}$	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.	$\frac{dy}{dx} = \frac{du}{dx} \times \frac{dy}{du}$ [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.	$\frac{d}{dx}(\sin x) = \cos x$

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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.	$\frac{d}{dx}[\tan^n u] = n \tan^{n-1} u \times \sec^2 u \times \frac{du}{dx}$		
21.	$\frac{d}{dx}(\sin^{-1} u) = \frac{1}{\sqrt{1-u^2}} \frac{du}{dx}$	22.	$\frac{d}{dx}(\cos^{-1} u) = \frac{-1}{\sqrt{1-u^2}} \frac{du}{dx}$
23.	$\frac{d}{dx}(\tan^{-1} u) = \frac{1}{1+u^2} \frac{du}{dx}$	24.	$\frac{d}{dx}(\cot^{-1} u) = \frac{-1}{1+u^2} \frac{du}{dx}$
25.	$\frac{d}{dx}(\sec^{-1} u) = \frac{1}{ u \sqrt{u^2-1}} \frac{du}{dx}$	26.	$\frac{d}{dx}(\operatorname{cosec}^{-1} u) = \frac{-1}{ u \sqrt{u^2-1}} \frac{du}{dx}$
27.	$\frac{dy}{dx} = \frac{dy}{dt} \times \frac{dt}{dx}$ [Parametric Equation]		
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.	$\int \sin(ax+b) dx = -\frac{1}{\frac{d}{dx}(ax+b)} \times \cos(ax+b) + c$		

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13.	$\int \cos(ax + b) dx = \frac{1}{\frac{d}{dx}(ax + b)} \times \sin(ax + b) + c$
14.	$\int \sec^2(ax + b) dx = \frac{1}{\frac{d}{dx}(ax + b)} \times \tan(ax + b) + c$
15.	$\int \frac{1}{\sqrt{a^2 - u^2}} du = \sin^{-1} \frac{u}{a} + c$
16.	$\int \frac{-1}{\sqrt{a^2 - u^2}} du = \cos^{-1} \frac{u}{a} + c$
17.	$\int \frac{1}{a^2 + u^2} du = \frac{1}{a} \tan^{-1} \frac{u}{a} + c$
18.	$\int \frac{-1}{a^2 + u^2} du = \frac{1}{a} \cot^{-1} \frac{u}{a} + c$
19.	$\int \frac{1}{u\sqrt{u^2 - a^2}} du = \frac{1}{a} \sec^{-1} \frac{u}{a} + c$
20.	$\int \frac{-1}{u\sqrt{u^2 - a^2}} du = \frac{1}{a} \operatorname{cosec}^{-1} \frac{u}{a} + c$
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.	$\begin{aligned} \cos 2\theta &= 2 \cos^2 \theta - 1 \\ &= 1 - 2 \sin^2 \theta \\ &= \cos^2 \theta - \sin^2 \theta \end{aligned}$
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	
$\int u dv = uv - \int v du$	