

SULIT



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

JABATAN MATEMATIK, SAINS & KOMPUTER

**PEPERIKSAAN AKHIR
SESI DISEMBER 2018**

DBM2013: ENGINEERING MATHEMATICS 2

**TARIKH : 16 APRIL 2019
MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)**

Kertas ini mengandungi **SEPULUH (10)** 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) Simplify the following expressions :

Permudahkan ungkapan-ungkapan yang berikut:

i. $\log_4 \frac{2}{7} + \log_4 \frac{14}{3} - \log_4 \frac{4}{15}$

[3 marks]

[3 markah]

ii. $\frac{3^{2n-1} \times 3^{n-3}}{3^{3n-2}}$

[3 marks]

[3 markah]

iii. $\frac{25^m \times 5^{m+1}}{125^{2-3m}}$

[4 marks]

[4 markah]

CLO1
C3

(b) Solve the following equations:

Selesaikan persamaan-persamaan berikut:

i. $4^x(8^{2x-1})=64$

[4 marks]

[4 markah]

ii. $3^{2x+1}=5$

[5 marks]

[5 markah]

iii. $\log_3(2x+5)=1+\log_3(2x-3)$

[6 marks]

[6 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**

CLO2
C2

- (a) Differentiate the following with respect to x .

Bezakan yang berikut terhadap x .

i. $y = 8x^3 + \frac{5}{2}x - 1$

[2 marks]

[2 markah]

ii. $y = 3 \sin 4x^2$

[3 marks]

[3 markah]

iii. $y = 3(2x^5 + x)^3$ (Using chain rule method)
(Guna kaedah petua rantai)

[5 marks]

[5 markah]

CLO2
C3

- (b) i. Calculate $\frac{dy}{dx}$ for equation $y = (1 - x^2)(3x + 1)^3$

Kirakan $\frac{dy}{dx}$ untuk persamaan $y = (1 - x^2)(3x + 1)^3$

[5 marks]

[5 markah]

- ii. Find the stationary points for the equation $y = 4x^3 + 3x^2 - 6x$ and determine their nature.

Cari titik-titik pegun bagi persamaan $y = 4x^3 + 3x^2 - 6x$ dan tentukan sifat-sifat titik tersebut.

[10 marks]

[10 markah]

QUESTION 3

SOALAN 3

CLO2
C2

(a) Differentiate the following equations:

Bezakan persamaan-persamaan berikut:

i. $4x - y^2 + 10xy = 2$

[5 marks]

[5 markah]

ii. $5x^2 - x^3 \sin y = 3y$

[5 marks]

[5 markah]

CLO2
C3(b) i. The parametric equations are given as $y = 2 \cos 5t$ and $x = 3t^2 - 5$.Determine $\frac{dy}{dx}$.*Persamaan-persamaan parametric diberi sebagai $y = 2 \cos 5t$ dan $x = 3t^2 - 5$.**Dapatkan $\frac{dy}{dx}$.*

[4 marks]

[4 markah]

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

[6 marks]

[6 markah]

- iii. Given $z = x^5 y + 2xy^2$. Calculate the total differential of z , dz when (x, y) changes from $(1, 2)$ to $(1.04, 1.93)$.

Diberi $z = x^5 y + 2xy^2$. Kirakan perubahan keseluruhan pada z , dz bila (x, y) berubah dari $(1, 2)$ ke $(1.04, 1.93)$

[5 marks]

[5 markah]

QUESTION 4

SOALAN 4

CLO2
C2

(a) Solve the following integrals.

Selesaikan kamiran-kamiran berikut.

i. $\int (2x^2 + 3) dx$

[2 marks]

[2 markah]

ii. $\int (3x^6 - 2x^2 + 7x + 5) dx$

[4 marks]

[4 markah]

iii. $\int (4t + 7)^4 dt$

(Using substitution method)

(Guna kaedah gantian)

[4 marks]

[4 markah]

CLO2
C3

(b) Evaluate the definite integrals below.

Nilaikan kamiran-kamiran tentu berikut.

i.
$$\int_{-1}^2 (4x - x^2) dx$$

[4 marks]

[4 markah]

ii.
$$\int_{-2}^{-1} \left(\frac{x^4 + 5x}{x^3} \right) dx$$

[5 marks]

[5 markah]

iii.
$$\int_1^2 (2x^2 + x) dx + \int_{-2}^3 (2x^2 + x) dx$$

[6 marks]

[6 markah]

QUESTION 5

SOALAN 5

CLO2
C2

(a) Determine the following integrals :

Tentukan kamiran-kamiran berikut :

i.
$$\int \frac{1}{4+81x^2} dx$$

[4 marks]

[4 markah]

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

[6 marks]

[6 markah]

CLO2
C3

(b) Solve the following integrals :

Selesaikan kamiran-kamiran berikut :

i.
$$\int \frac{5x+2}{(x+1)(x+4)} dx$$

(using partial fraction expansion)

(guna kembangan pecahan separa)

[8 marks]

[8 markah]

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

(using integration by part)

(Guna kaedah kamiran bahagian demi bahagian)

[7 marks]

[7 markah]

SOALAN TAMAT

FORMULA SHEET FOR DBM2013

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.	$\frac{d}{dx}(x^n) = nx^{n-1} \text{ [Power Rule]}$
3.	$\frac{d}{dx}(ax^n) = anx^{n-1}$	4.	$\frac{d}{dx}(f(x) \pm g(x)) = f'(x) \pm g'(x)$
5.	$\frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx} \text{ [Product Rule]}$	6.	$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2} \text{ [Quotient Rule]}$
7.	$\frac{dy}{dx} = \frac{du}{dx} \times \frac{dy}{du} \text{ [Chain Rule]}$	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.	$\frac{d}{dx} [\tan^n u] = n \tan^{n-1} u \times \sec^2 u \times \frac{du}{dx}$		
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.	$\int \sin(ax + b) dx = -\frac{1}{\frac{d}{dx}(ax + b)} \times \cos(ax + b) + c$		
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		
$\int u dv = uv - \int v du$		

