SULIT

POLITEKNIK MALAYSIA

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)

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

Diberi $z = 18 - 5x^3 y^2 - 2y^3$. *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 mark

[*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 mark

[*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 expantion]
[*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

FORMULA SHEET FOR DBM2013 : ENGINEERING MATHEMATICS 2

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.	$\frac{d}{dx}(x^n) = nx^{n-1}$ *[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.	$\frac{d}{dx}\left(e^{ax+b}\right) = e^{ax+b} \times \frac{d}{dx}(ax+b)$	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.	$\frac{d}{dx}[tan^n u] = n\,tan^{n-1} u \times sec^2 u \times \frac{du}{dx}$		
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.	$\frac{d}{dx}(\sec^{-1} u) = \frac{1}{\lvert u\rvert\sqrt{u^2-1}}\frac{du}{dx}$	26.	$\frac{d}{dx}(co\sec^{-1} u) = \frac{-1}{\lvert u\rvert\sqrt{u^2-1}}\frac{du}{dx}$
27.	$\frac{dy}{dx} = \frac{dy}{dt} \times \frac{dt}{dx}$ *[Parametric Equation]*		

INTEGRATION

1.	$\int ax^n dx = \frac{ax^{n+1}}{n+1} + c \quad ;\{n \neq -1\}$	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.	$\int \frac{1}{x}\ dx = \ln x + c$	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.	$\int \cos(ax+b)\,dx = \dfrac{1}{\frac{d}{dx}(ax+b)} \times \sin(ax+b) + c$
14.	$\int sec^2(ax+b)\,dx = \dfrac{1}{\frac{d}{dx}(ax+b)} \times \tan(ax+b) + c$
15.	$\int \dfrac{1}{\sqrt{a^2-u^2}}du = \sin^{-1}\dfrac{u}{a} + c$
16.	$\int \dfrac{-1}{\sqrt{a^2-u^2}}du = \cos^{-1}\dfrac{u}{a} + c$
17	$\int \dfrac{1}{a^2+u^2}du = \dfrac{1}{a}\tan^{-1}\dfrac{u}{a} + c$
18.	$\int \dfrac{-1}{a^2+u^2}du = \dfrac{1}{a}\cot^{-1}\dfrac{u}{a} + c$
19.	$\int \dfrac{1}{u\sqrt{u^2-a^2}}du = \dfrac{1}{a}\sec^{-1}\dfrac{u}{a} + c$
20.	$\int \dfrac{-1}{u\sqrt{u^2-a^2}}du = \dfrac{1}{a}\text{cosec}^{-1}\dfrac{u}{a} + c$

IDENTITY TRIGONOMETRY

1.	$cos^2\theta + sin^2\theta = 1$	2.	$1 + tan^2\theta = sec^2\theta$
3.	$1 + cot^2\theta = cosec^2\theta$	4.	$\sin 2\theta = 2\sin\theta\cos\theta$
5.	$\cos 2\theta = 2cos^2\theta - 1$ $= 1 - 2sin^2\theta$ $= cos^2\theta - sin^2\theta$	6.	$\tan 2\theta = \dfrac{2\tan\theta}{1 - tan^2\theta}$
7.	$\tan\theta = \dfrac{\sin\theta}{\cos\theta}$	8.	$\cot\theta = \dfrac{\cos\theta}{\sin\theta} = \dfrac{1}{\tan\theta}$
9.	$\sec\theta = \dfrac{1}{\cos\theta}$	10.	$cosec\,\theta = \dfrac{1}{\sin\theta}$

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

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