SULIT

POLITEKNIK MALAYSIA

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

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI JUN 2019

DBM2013 : ENGINEERING MATHEMATICS 2

TARIKH : 30 OKTOBER 2019
MASA : 11.15 PAGI - 1.15 PETANG (2 JAM)

Kertas ini mengandungi **SEPULUH (10)** halaman bercetak.
Bahagian A: Subjektif (1 soalan)
Bahagian B: Subjektif (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)** subjective question that **MUST** be answered.

ARAHAN:

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

QUESTION 1

SOALAN 1

CLO1 C2 (a) Simplify the following expressions :

Permudahkan ungkapan-ungkapan berikut :

i. $4^x \div (256^{x-1} \times 128)$

[5 marks]

[*5 markah*]

ii. $\log_9 36 - \log_9 \frac{1}{9} - \log_9 4$

[5 marks]

[*5 markah*]

CLO1
C3

(b) i. Solve the following equations :

Selesaikan persamaan-persamaan yang berikut :

a) $2^{2x-5} = 64^{3x}$

[4 marks]

[*4 markah*]

b) $5^{x-3} = 3^{x}$

[6 marks]

[*6 markah*]

ii. Given that $log_m 3 = p$ and $log_m 5 = q$, write $log_3 45$ in terms of p and q.

Diberi $log_m 3 = p$ *dan* $log_m 5 = q$, *tuliskan* $log_3 45$ *dalam sebutan p dan q.*

[5 marks]

[*5 markah*]

SECTION B: 75 MARKS

BAHAGIAN B: 75 MARKAH

INSTRUCTION:

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

ARAHAN:

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

QUESTION 2

SOALAN 2

CLO2
C2

(a) Differentiate the following functions :

Bezakan fungsi-fungsi yang berikut :

i. $y = \frac{5}{7}x^3 - 4x^{-2} + \sin 3x$

[5 marks]

[*5 markah*]

ii. $y = -6(2x + 5)^{-4}$ (use Chain Rule)

(guna Petua Rantai)

[5 marks]

[*5 markah*]

CLO2
C3

(b) Solve each of the followings using a suitable method :

Selesaikan setiap yang berikut dengan menggunakan kaedah yang sesuai :

i. $y = (3x + 2)(4x - 1)^2$

[5 marks]

[*5 markah*]

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

[6 marks]

[*6 markah*]

iii. $y = cos^3 4x$

[4 marks]

[*4 markah*]

QUESTION 3
SOALAN 3

CLO2 C2 (a) Differentiate the following equations.

Bezakan persamaan - persamaan berikut.

i. $3y^2 - 5x^2 = 7 + 5y^3$

[4 marks]

[*4 markah*]

ii. $2x^3 + 5xy = \cos 2y + 9x$

[6 marks]

[*6 markah*]

CLO2 C3 (b) i. Determine $\frac{dy}{dx}$ for the parametric equation below in terms of t.

Tentukan $\frac{dy}{dx}$ *bagi persamaan parametrik di bawah dalam sebutan t.*

$x = 2e^{3t}$ $y = 7t^2 - 6$

[5 marks]

[*5 markah*]

ii. Given that $z = 2x^4y^3 + 3xsin\ 5y$. Calculate $\frac{\partial z}{\partial x}, \frac{\partial z}{\partial y}$ *and* $\frac{\partial^2 z}{\partial x \partial y}$.

Diberi $z = 2x^4y^3 + 3xsin\ 5y$. *Kirakan* $\frac{\partial z}{\partial x}, \frac{\partial z}{\partial y}$ *dan* $\frac{\partial^2 z}{\partial x \partial y}$.

[6 marks]

[*6 markah*]

iii. A right circular cone radius increases at the rate of 4cm/minute. Calculate how fast is the cone's volume changing when the radius is 13cm and the height is 22cm. ($V_{cone} = \frac{1}{3}\pi r^2 h$).

Jejari bagi sebuah kon bersudut tepat meningkat pada kadar 4cm/minit. Kira berapa laju perubahan isipadu kon apabila jejari 13cm dan tinggi 22cm. ($V_{kon} = \frac{1}{3}\pi r^2 h$)

[4 marks]

[*4 markah*]

QUESTION 4

SOALAN 4

CLO2
C2

(a) Determine the following integrals :

Tentukan kamiran-kamiran berikut :

i. $\int 12e^{2x}dx$

[2 marks]

[*2 markah*]

ii. $\int(2-x)(1+x)dx$

[4 marks]

[*4 markah*]

iii. $\int(\frac{-15}{3}+\sqrt{1+x})\,dx$

[4 marks]

[*4 markah*]

CLO2
C3

(b) i) Solve the definite integrals below :
Selesaikan kamiran tentu berikut :

i. $\int_0^2 (3x^3 - 3x^2)dx$

[4 marks]
[*4 markah*]

ii. $\int_{-2}^{-1} \left(\frac{2x^5 - 7x}{x^4}\right) dx$

[6 marks]
[*6 markah*]

ii) Given that $\int_2^5 f(x)\, dx = 7$, solve $\int_5^2 [f(x) - 5]dx$
Diberi $\int_2^5 f(x)\, dx = 7$, *selesaikan* $\int_5^2 [f(x) - 5]dx$

[5 marks]
[*5 markah*]

QUESTION 5

SOALAN 5

CLO2 C2

(a) Determine the integral for the following inverse trigonometric functions.
Tentukan kamiran bagi fungsi trigonometri songsang berikut.

i. $\int \frac{dx}{\sqrt{1-4x^2}}$

[5 marks]
[*5 markah*]

ii. $\int \frac{12}{1+9x^2} dx$

[5 marks]
[*5 markah*]

CLO2 C3

(b) i) Solve the following using integration by part.
Selesaikan yang berikut dengan menggunakan kamiran bahagian demi bahagian.

$$\int \frac{x^{-2}}{2} \ln x \, dx$$

[7 marks]
[*7 markah*]

ii) Calculate the volume of the solid generated by revolving the region between x-axis and parabola $y = x - x^2$ through a complete revolution about the x-axis between the limits 0 to 1.

Kirakan isipadu pepejal yang terjana pada paksi – x dengan lengkung $y = x - x^2$ *melalui satu putaran lengkap pada paksi – x di antara had 0 hingga 1.*

[8 marks]
[*8 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.**	$\frac{d}{dx}(x^n) = nx^{n-1}$ [Power Rule]
3.	$\frac{d}{dx}(ax^n) = anx^{n-1}$	**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.	$\frac{dy}{dx} = \frac{du}{dx} \times \frac{dy}{du}$ [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.	$\int \cos(ax+b)\ dx = \frac{1}{\frac{d}{dx}(ax+b)} \times sin\,(ax+b) + c$		

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

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