SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN MATEMATIK, SAINS DAN KOMPUTER

PEPERIKSAAN AKHIR

SESI DISEMBER 2015

DBM2013 : ENGINEERING MATHEMATICS 2

TARIKH : 06 APRIL 2016
MASA : 8.30AM - 10.30AM (2 JAM)

Kertas ini mengandungi **SEMBILAN (9)** halaman bercetak.
Bahagian A: Struktur (1soalan)
Bahagian B: Struktur (4 soalan)
Dokumen sokongan yang disertakan : Kertas Graf, Formula dsb / Tiada

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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) compulsory** structured question.

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

QUESTION 1
SOALAN 1

CLO1
C1

(a) Simplify each of the following :
Permudahkan setiap yang berikut :

i. $2^{2x} \times 4^{2x}$ [3 marks]
[*3 markah*]

ii. $2\log_2 3 + \log_2 xy - 3\log_2 y$ [3 marks]
[*3 markah*]

CLO1
C2

(b) Solve the following equations :
Selesaikan persamaan berikut :

i. $2 \times 2^{x+1} = 8$ [4 marks]
[*4 markah*]

ii. $\log_2 3 + \log_2 (x-1) = 4$ [5 marks]
[*5 markah*]

iii. $\log(4x-1) - \log 3 = \log(x+2)$ [5 marks]
[*5 markah*]

CLO1
C3

(c) Solve the equation $3^{2x} \cdot 9^{(x-1)} = 27$

Selesaikan persamaan $3^{2x} \cdot 9^{(x-1)} = 27$ [5 marks]
[5 *markah*]

QUESTION 3

SOALAN 3

CLO2
C2

(a)

i. The parametric equation of a function is given as $y = 3\cos 2t, \quad x = 2\sin t$.
Determine the expressions for $\frac{dy}{dx}$.
Fungsi persamaan parametik diberi sebagai $y = 3\cos 2t, \quad x = 2\sin t$. *Tentukan ungkapan* $\frac{dy}{dx}$.

[4 marks]
[*4 markah*]

ii. Find $\frac{dy}{dx}$ for equation $x^3 + 3x^2y - y^2 = 7$ by using the Implicit Differentiation.
Cari $\frac{dy}{dx}$ *bagi persamaan* $x^3 + 3x^2y - y^2 = 7$ *menggunakan Pembezaan Tersirat.*

[4 marks]
[*4 markah*]

CLO2
C3

(b)

i. Given $z = 5x^3 + 3x^2y^4 - 2y^2$, find $\frac{\partial z}{\partial x}, \frac{\partial z}{\partial y}, \frac{\partial^2 z}{\partial x^2}$ and $\frac{\partial^2 z}{\partial y^2}$.

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

[8 marks]
[*8 markah*]

ii. A spherical balloon is inflated at a rate of 3 cm^3/s. Find the increment rate of the radius when the radius is 2 *cm* and 4 *cm*.
Sebiji belon dipamkan pada kadar $3cm^3/s$. *Cari kadar perubahan jejari apabila jejarinya ialah 2cm dan 4cm.*

[9 marks]
[*9 markah*]

QUESTION 5

SOALAN 5

CLO2
C2

(a) Diagram 5(a) shows a region which is enclosed by a curve $y = x^2$ and a line $y = -2x + 3$ meets at point A. The line $y = -2x + 3$ meets the x-axis at B. Find the value of the volume that is obtained when the shaded region is rotated 360^o at x-axis.

Gambarajah 5(a) menunjukkan kawasan yang ditutup oleh lengkung $y = x^2$ dan garis lurus $y = 2x + 3$ bertemu di titik A. Garis $y = 2x + 3$ bertemu paksi x pada B. Dapatkan nilai isipadu yang diperolehi apabila kawasan berlorek diputarkan 360^o pada paksi-x.

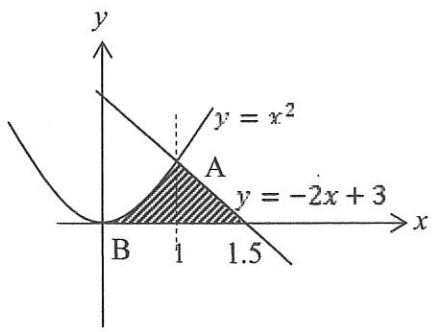

Diagram 5(a) / *Rajah 5(a)*

[8 marks]
[*8 markah*]

CLO2
C3

(b) Integrate the following function of integrals by using the suitable method:
Kamirkan persamaan kamiran berikut menggunakan kaedah yang sesuai:

i) $\int 3x^3 \sin x \, dx$

[8 marks]
[*8 markah*]

ii) $\int \frac{10x+15}{x^2+3x-10} \, dx$

[9 marks]
[*9 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.	$\frac{d}{dx}(f(x) \pm g(x)) = f'(x) \pm g'(x)$
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.	$\frac{d}{dx}(\sin x) = \cos x$
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.	$\int ax^n dx = \frac{ax^{n+1}}{n+1} + c \;\; ;\{n \neq -1\}$	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.	$\int sec^2(ax+b)\,dx = \dfrac{1}{\frac{d}{dx}(ax+b)} \times \tan(ax+b) + c$
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

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