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SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI JUN 2016

DBM2013: ENGINEERING MATHEMATICS 2

TARIKH : 25 OKTOBER 2016
MASA : 8.30 AM - 10.30 AM (2 JAM)

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

Bahagian A: Struktur (1 soalan)
Bahagian B: Struktur (4 soalan)
Dokumen sokongan yang disertakan : Kertas Graf, 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) 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 expressions.
Permudahkan setiap ungkapan berikut.

i. $5^{2n+1} \div 25^{n-1} \times 125^{n+1}$

[3 marks]
[*3 markah*]

ii. $2 + 4log_3 x - \frac{1}{2} log_3 y$

[3 marks]
[*3 markah*]

CLO1 C2 (b) Calculate the value of x for the following equations.
Kirakan nilai x bagi persaman berikut.

i. $8^{5x} = 4^{4x+14}$

[4 marks]
[*4 markah*]

ii. $\log_5(2x + 5) = 2$

[4 marks]
[*4 markah*]

iii. $\log x + \log(x - 1) = \log(3x + 12)$

[6 marks]
[*6 markah*]

CLO1
C3

(c) Given $log_7 5 = 0.8271$ and $log_7 6 = 0.9208$. Determine the value of $log_7 30 + log_7 \left(1\frac{1}{5}\right)$ without using the calculator.

Diberi $log_7 5 = 0.8271$ *dan* $log_7 6 = 0.9208$. *Tentukan nilai bagi* $log_7 30 + log_7 \left(1\frac{1}{5}\right)$ *tanpa menggunakan kalkulator.*

[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 with respect to x.

Bezakan yang berikut terhadap x.

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

[3 marks]
[3 *markah*]

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

[5 marks]
[5 markah]

CLO2 C3

(b) Differentiate the following function by using a suitable method.

Bezakan fungsi-fungsi berikut menggunakan kaedah yang sesuai.

i. $y = \sin\left(\frac{1}{2}x^4 - 3\right)^2$

[5 marks]
[*5 markah*]

ii. $y = (2x + 3)^6 (x - 5)^5$

[5 marks]
[*5 markah*]

iii. $y = \frac{\cos 2x}{\tan 2x}$

[7 marks]
[*7 markah*]

QUESTION 3

SOALAN 3

CLO2
C2

(a) Differentiate each of the following function with respect to x :

Bezakan setiap fungsi yang berikut terhadap x :

i. $2x^3 + 6y - 5xy^2 = 3$

[4 marks]

[4 *markah*]

ii. $y^2 - 7x = \cos 2y$

[4 marks]

[*4 markah*]

CLO2
C3

(b)

i. Find the $\frac{dy}{dx}$ for parametric equation below in term of t.

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

$$x = 3\ln 2t \ , \qquad y = 4t^2 - t$$

[4 marks]

[*4 markah*]

ii. Given $z = 3x^2y + e^{2x}$. Determine the total differential of z.

Diberikan $z = 3x^2y + e^{2x}$. *Tentukan pembezaan penuh bagi z.*

[6 marks]

[*6 markah*]

iii. The radius of a circle is decreasing at a rate of $7cm/s$. Find the rate of change of the area for circle at the instant when the radius is $4m$.

Jejari bagi sebuah bulatan berkurang pada kadar $7cm/s$. *Cari kadar perubahan luas bagi bulatan apabila jejarinya* $4m$.

[7 marks]

[*7 markah*]

QUESTION 4

SOALAN 4

CLO2 C2

(a) Solve the following integrals:

Selesaikan pengamiran berikut:

i. $\int \left(\frac{2}{5}x^5 - \frac{3}{x^2} + 1 \right) dx$ [3 marks]

[*3 markah*]

ii. $\int x^2 \left(4 - 3x^3\right) dx$ [3 marks]

[*3 markah*]

CLO2 C3

(b) Integrate each of the functions below:

Kamirkan setiap fungsi berikut:

i. $\int \frac{3}{(4s+5)^3} ds$ [5 marks]

[*5 markah*]

ii. $\int \frac{3e^{4x} - 5e^{-x}}{e^x} dx$ [4 marks]

[*4 markah*]

iii. $\int 6\sec^2\left(8x^3 - 3\right) dx$ [4 marks]

[*4 markah*]

iv. $\int_0^1 3m^2 \left(m^3 + 3\right)^4 dm$ [6 marks]

[*6 markah*]

QUESTION 5

SOALAN 5

CLO2
C2

(a) Integrate the following functions.

Kamirkan setiap fungsi berikut.

i. $\int \frac{dx}{\sqrt{49-x^2}}$

[3 marks]

[*3markah*]

ii. $\int \frac{3\,dx}{25+16x^2}$

[5 marks]

[*5markah*]

CLO2
C3

(b) i. Integrate the following function by using partial fraction.

Kamirkan fungsi berikut dengan menggunakan pecahan separa.

$$\int \frac{3x+2}{x^2-x-2}dx$$

[9 marks]

[*9 markah*]

ii. Find the volume of the solid formed when the shaded region is bounded by the curve $y = x^2 + 1$ and the line $y = x + 7$ is rotated through $360°$ on the x-axis.

Dapatkan isipadu pepejal yang terbentuk apabila kawasan berlorek yang dilingkungi oleh lengkung $y = x^2 + 1$ dan garis $y = x + 7$ diputar $360°$ pada paksi-x

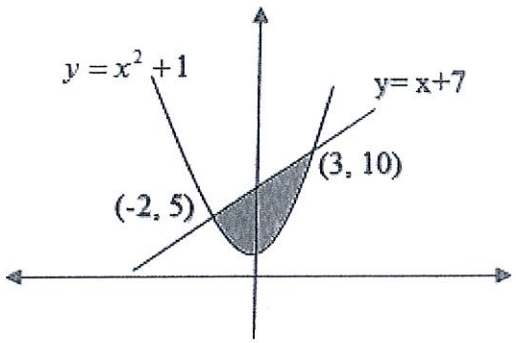

Figure 5b(ii)/Rajah 5b(ii)

[8 marks]

[*8 markah*]

SOALAN TAMAT

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.	$\int \frac{-1}{u\sqrt{u^2-a^2}} du = \frac{1}{a}\text{cosec}^{-1}\frac{u}{a} + c$

Identity Trigonometry			
1.	$cos^2\theta + sin^2\theta = 1$	2.	$1 + tan^2\theta = sec^2\theta$
3.	$1 + cot^2\theta = cosec^2\theta$	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.	$\tan 2\theta = \frac{2\tan\theta}{1 - tan^2\theta}$
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.	$cosec\,\theta = \frac{1}{\sin\theta}$

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

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

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.	$\int ax^n dx = \frac{ax^{n+1}}{n+1} + c \quad ;\{n \neq -1\}$	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.	$\int \cos(ax+b)\ dx = \frac{1}{\frac{d}{dx}(ax+b)} \times sin\,(ax+b) + c$		