SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI JUN 2017

DBM2013 : ENGINEERING MATHEMATICS 2

TARIKH : 21 OKTOBER 2017
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)

SECTION A: 25 MARKS

BAHAGIAN A: 25 MARKAH

INSRUCTION:

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 C1 (a) State each of the following functions in the simplest form:

Nyatakan setiap fungsi yang berikut dalam bentuk paling ringkas:

i. $\dfrac{3^n}{81^{n+1}\times 27}$

[3 marks]

[*3 markah*]

ii. $5\log m - \log\sqrt[3]{m} + \log 2m$

[3 marks]

[*3 markah*]

CLO1 C2 (b) Determine the following equations:

Tentukan persamaan-persamaan berikut:

i. $3^{4-x} = 9$

[3 marks]

[*3 markah*]

ii. $\dfrac{25^{\frac{x}{2}}\times 125}{5} = 3125^{x}$

[5 marks]

[*5 markah*]

iii. $\dfrac{1}{2}\log_3 x + \log_9 4x = 0$

[6 marks]

[*6 markah*]

CLO1 C3 (c) Calculate the value of p for the following equation:

Kira nilai p bagi persamaan berikut:

$$2\log_p 10 - 2\log_p\left(\frac{5}{2}\right) = 4 - \log_p p^2$$

[5 marks]

[*5 markah*]

SECTION B: 75 MARKS

BAHAGIAN B: 75 MARKAH

INSRUCTION:

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 functions with respect to x:

Bezakan fungsi-fungsi berikut terhadap x*:*

i. $y = \frac{2}{3}x^3 - 4\pi$

[2 marks]

[*2 markah*]

ii. $y = \frac{1}{e^{3-7x}}$

[2 marks]

[*2 markah*]

iii. $y = \frac{1}{15}\ln(5x+1)$

[2 marks]

[*2 markah*]

iv. $y = \tan 2x$

[2 marks]

[*2 markah*]

CLO2 C3

(b)

i. Show the second derivative for the function $y = \sin^2 2x$

Tunjukkan pembezaan peringkat kedua bagi fungsi $y = \sin^2 2x$

[7 marks]

[*7 markah*]

ii. A curve has the equation $y = 2x^3 - 6x^2 + 6$. Solve the given equation to find the turning points and their natures.

Satu lengkung mempunyai persamaan $y = 2x^3 - 6x^2 + 6$. *Selesaikan persamaan tersebut untuk mencari titik-titik pusingan dan sifatnya.*

[10 marks]

[*10 markah*]

QUESTION 3

SOALAN 3

CLO2 C2 (a) Differentiate the following equations:

Bezakan persamaan-persamaan berikut:

i. $6x^2 - y^3 = 1$

[3 marks]

[*3 markah*]

ii. $4x^2 + 3xy^3 - y^2 = 6.$

[5 marks]

[*5 markah*]

CLO2 C3 (b)

i. The parametric equation function is given as $y = 5\ln(2t - 3)$ and $x = 3t^2 + 4$. Compute $\frac{dy}{dx}$.

Fungsi persamaan parametrik diberi sebagai $y = 5\ln(2t - 3)$ *dan* $x = 3t^2 + 4$. *Kirakan* $\frac{dy}{dx}$.

[4 marks]

[*4 markah*]

ii. Given $z = 3x^3y^2 + x\sin 2y$. Compute $\frac{\partial z}{\partial x}, \frac{\partial z}{\partial y}, \frac{\partial^2 z}{\partial x^2}$ and $\frac{\partial z}{\partial x \partial y}$.

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

[8 marks]

[*8 markah*]

iii. A right circular cone radius increases at the rate of 3 $cm/minute$. Calculate how fast is the cone's volume changing when the radius is 16 cm and the height is 21 cm? $V_{cone} = \frac{1}{3}\pi r^2 h$

Jejari bagi sebuah kon bersudut tepat meningkat pada kadar $3cm/minit$. *Kira berapa laju perubahan isipadu kon apabila jejari 16* cm *dan tinggi 21* cm?

$V_{cone} = \frac{1}{3}\pi r^2 h$

[5 marks]

[*5 markah*]

QUESTION 4

SOALAN 4

CLO2 C2 (a) Determine the integrals of the following:

Tentukan kamiran bagi yang berikut:

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

[2 marks]

[*2 markah*]

ii. $\int 2x(x-3)dx$

[2 marks]

[*2 markah*]

iii. $\int \left(\frac{x^4+1}{x^2}\right)dx$

[4 marks]

[*4 markah*]

CLO2 C3 (b) Solve the integrals of the following:

Selesaikan setiap kamiran yang berikut:

i. $\int (e^{\sin x} \cos x)\, dx$

[5 marks]

[*5 markah*]

ii. $\int_2^4 \left(\frac{1}{2x+4}\right)dx$

[5 marks]

[*5 markah*]

iii. $\int_0^1 \left(\frac{x^3}{\sqrt{x^4+12}}\right)dx$

[7 marks]

[*7 markah*]

QUESTION 5

SOALAN 5

CLO2 C2 (a) Figure 5(a) below shows a region which is enclosed by the graph of $y = x + 1$ and $y = (x-1)^2$. Compute the volume of solid revolution formed when the shaded region is rotated 360° about x-axis.

Gambarajah 5(a) di bawah menunjukkan kawasan yang dibatasi oleh graf $y = x + 1$ *dan* $y = (x-1)^2$. *Kirakan isipadu janaan bongkah yang terbentuk apabila kawasan berlorek diputarkan* 360° *terhadap paksi-x.*

[8 marks]

[*8 markah*]

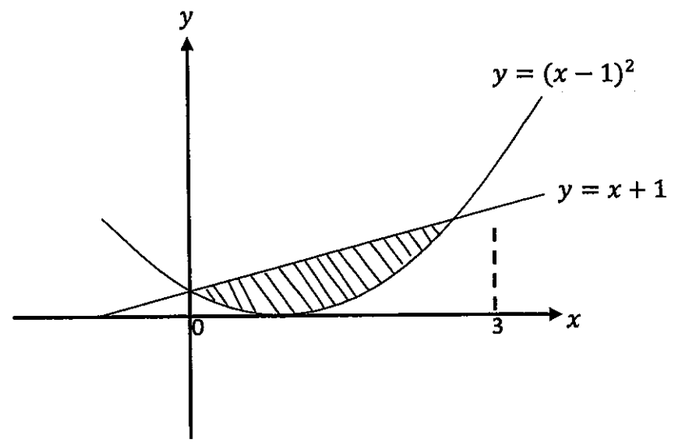

Figure 5(a)

Gambarajah 5(a)

CLO2
C3

(b) Solve each of the following integrals by using suitable method:
Selesaikan setiap kamiran yang berikut menggunakan kaedah yang sesuai:

i. $\int x^2 e^{4x} dx$

[9 marks]
[*9 markah*]

ii. $\int \frac{2x^2+8}{x^3+x^2-2x} dx$

[8 marks]
[*8 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.	$\frac{d}{dx}(e^{ax+b}) = e^{ax+b} \times \frac{d}{dx}(ax+b)$	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.	$\int sec^2(ax+b)\ dx = \frac{1}{\frac{d}{dx}(ax+b)} \times \tan(ax+b) + c$		

SULIT

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

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 A CURVE

1.	$A_x = \int_a^b y\,dx$	2.	$A_y = \int_a^b x\,dy$

VOLUME OF REVOLUTION

1.	$V_x = \pi\int_a^b y^2\,dx$	2.	$V_y = \pi\int_a^b x^2\,dy$

INTEGRATION BY PARTS

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