

SULIT



**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)

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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
C1

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

Nyatakan setiap fungsi yang berikut dalam bentuk paling ringkas:

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

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

[5 marks]

[5 markah]

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

[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

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 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]

SULIT

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

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?

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

[5 marks]

[5 markah]

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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]

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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 diputarakan 360° terhadap paksi-x.

[8 marks]

[8 markah]

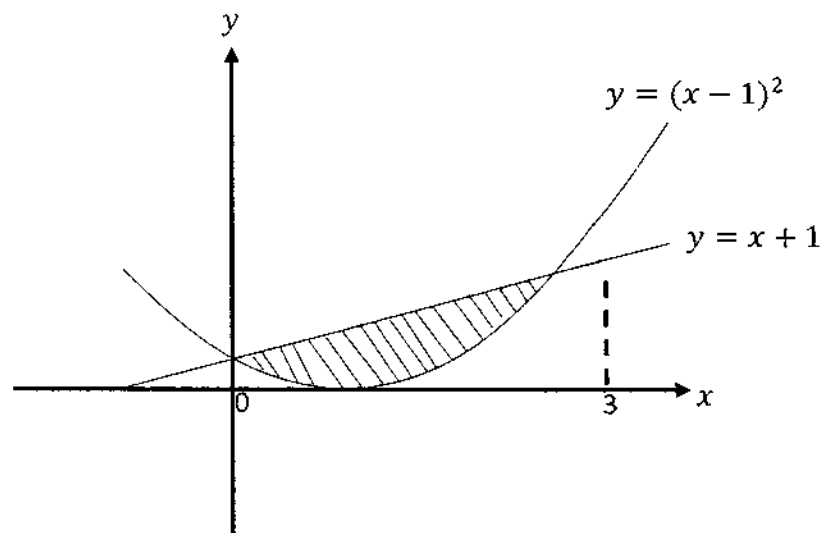


Figure 5(a)
Gambarajah 5(a)

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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.	$\frac{a^m}{a^n} = (\sqrt[n]{a})^m$	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.	$\frac{d}{dx}(x^n) = nx^{n-1} \text{ [Power Rule]}$
3.	$\frac{d}{dx}(ax^n) = anx^{n-1}$	4.	$\frac{d}{dx}(f(x) \pm g(x)) = f'(x) \pm g'(x)$
5.	$\frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx} \text{ [Product Rule]}$	6.	$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2} \text{ [Quotient Rule]}$
7.	$\frac{dy}{dx} = \frac{du}{dx} \times \frac{dy}{du} \text{ [Chain Rule]}$	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.	$\frac{d}{dx}(\tan x) = \sec^2 x$

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

Identity Trigonometry

1.	$\cos^2 \theta + \sin^2 \theta = 1$	2.	$1 + \tan^2 \theta = \sec^2 \theta$
3.	$1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$	4.	$\sin 2\theta = 2 \sin \theta \cos \theta$
5.	$\cos 2\theta = 2 \cos^2 \theta - 1$ $= 1 - 2 \sin^2 \theta$ $= \cos^2 \theta - \sin^2 \theta$	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.	$\operatorname{cosec} \theta = \frac{1}{\sin \theta}$

AREA UNDER CURVE

1.	$A_x = \int_a^b y dx$	2.	$A_y = \int_a^b x dy$
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VOLUME UNDER CURVE

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

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

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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.	$\frac{d}{dx} (\sec^{-1} u) = \frac{1}{ u \sqrt{u^2-1}} \frac{du}{dx}$	26. $\frac{d}{dx} (\operatorname{cosec}^{-1} u) = \frac{-1}{ u \sqrt{u^2-1}} \frac{du}{dx}$
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.	$\int \sec^2(ax + b) dx = \frac{1}{\frac{d}{dx}(ax + b)} \times \tan(ax + b) + c$		