

SULIT



BAHAGIAN PEPERIKSAAN DAN PENILAIAN  
JABATAN PENDIDIKAN POLITEKNIK  
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN MATEMATIK, SAINS DAN KOMPUTER

PEPERIKSAAN AKHIR

SESI JUN 2015

**DBM2013: ENGINEERING MATHEMATICS 2**

**TARIKH : 28 OKTOBER 2015**

**MASA : 2.30 PM - 4.30 PM (2 JAM)**

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Kertas ini mengandungi **SEMBILAN (9)** halaman bercetak.

Bahagian A: Struktur (1 soalan, jawab **SEMUA**)

Bahagian B: Struktur (4 soalan, jawab 3 soalan)

Dokumen sokongan yang disertakan : Formula

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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)** subjective question. Answer **ALL** the questions.

**ARAHAN:**

*Bahagian ini mengandungi SATU (1) soalan subjektif. Jawab SEMUA soalan.*

**QUESTION 1**  
**SOALAN 1**

CLO1  
C2

(a) Simplify the following expressions.

*Permudahkan ungkapan berikut.*

(i)  $x^{\frac{3}{2}} \div x^4 \times x^{-1}$

[3 marks]  
[3 markah]

(ii)  $\log_2 64$

[3 marks]  
[3 markah]

CLO1  
C3

(b) Solve the following expressions.

*Selesaikan ungkapan berikut.*

(i)  $27^{4x} = \frac{1}{243}$

[4 marks]  
[4 markah]

(ii)  $2^{6x} - 8^{10-2x} = 0$

[5 marks]  
[5 markah]

(iii)  $3 \log 2 + \log(4x - 1) = \log(7 - 8x)$

[5 marks]  
[5 markah]

CLO1  
C4

(c) Calculate the value of x.

*Kirakan nilai x.*

$$2 \log 2x + \log 3x = \log 96$$

[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  
C3

(a) Differentiate all the following functions.

*Bezakan setiap fungsi berikut.*

(i) 
$$y = \frac{2x^6 + 4x^5 + 3x}{x}$$

[3 marks]

[3 markah]

(ii) 
$$y = (4 - 3x^3)^4$$

[4 marks]

[4 markah]

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

[5 marks]

[5 markah]

(iv) 
$$y = 3 \sin^2(2x^2 - 1)$$

[5 marks]

[5 markah]

CLO2  
C4(b) Solve the stationary points for  $y = 3x^3 + x^2$  and determine the maximum and minimum points.*Selesaikan koordinat titik pegun bagi lengkung  $y = 3x^3 - 2x$  dan tentukan titik maksimum dan titik minimum.*

[8 marks]

[8 markah]

QUESTION 3  
SOALAN 3

CLO2  
C3

- (a) (i) Find the rate of change of the square area whose side is 8 cm long if the side length is increasing at 2 cm/min.

Cari kadar perubahan luas segi empat sama dimana sisinya adalah 8 cm, jika sisinya bertambah 2 cm/min.

[8 marks]  
[8 markah]

- (ii) The parametric equations of a curve are  $x = \frac{t^2 - 2}{1+t}$  and  $y = \frac{1}{1+t}$ . Find  $\frac{dy}{dx}$  in terms of  $t$ .

Persamaan parameter sebuah lengkung adalah  $x = \frac{t^2 - 2}{1+t}$  dan  $y = \frac{1}{1+t}$ . Cari  $\frac{dy}{dx}$  dalam sebutan  $t$ .

[9 marks]  
[9 markah]

CLO2  
C4

- (b) Find  $\frac{\partial z}{\partial x}$ ,  $\frac{\partial z}{\partial y}$ ,  $\frac{\partial^2 z}{\partial x \partial y}$  and  $\frac{\partial^2 z}{\partial y \partial x}$  for the function below.

Cari  $\frac{\partial z}{\partial x}$ ,  $\frac{\partial z}{\partial y}$ ,  $\frac{\partial^2 z}{\partial x \partial y}$  and  $\frac{\partial^2 z}{\partial y \partial x}$  bagi fungsi di bawah.

$$z = (8x + 3y)(7x + 5y)$$

[8 marks]  
[8 markah]

QUESTION 4  
SOALAN 4

CLO2  
C2

- (a) Solve the following integrals.

Selesaikan pengamiran berikut.

(i)  $\int (2x^2 + 3) dx$

[2 marks]  
[2 markah]

(ii)  $\int (4t + 7)^4 dt$

[Use substitution method]

[Guna kaedah gantian]

[4 marks]  
[4 markah]

CLO2  
C3

- (b) Evaluate the definite integrals below.

Tentukan nilai kamiran tentu berikut.

(i)  $\int_{-1}^2 (4x - x^2) dx$

[4 marks]  
[4 markah]

(ii)  $\int_{-2}^{-1} \left( \frac{x^4 + 5x}{x^3} \right) dx$

[6 marks]  
[6 markah]

(iii)  $\int_1^2 (2x^2 + x) dx + \int_{-2}^3 (2x^2 + x) dx$

[9 marks]  
[9 markah]

**QUESTION 5**  
**SOALAN 5**

CLO2  
C3 (a) Integrate each of the following.

Kamirkan setiap yang berikut.

(i)  $\int x \cos x dx$

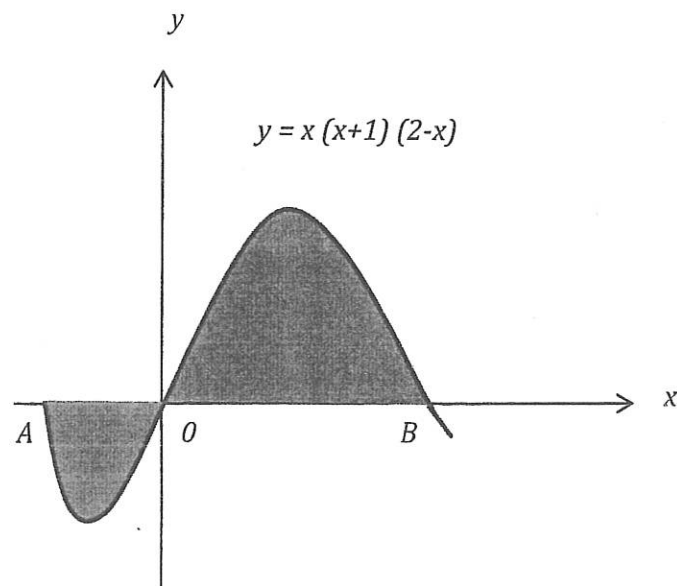
[6 marks]  
[6 markah]

(ii)  $\int \frac{2x}{(x+1)(x-3)} dx$

[11 marks]  
[11 markah]

CLO2  
C4 (b) Find the area of the curve below between  $x = A$  to  $x = B$ .

Carikan luas lengkung antara  $x = A$  hingga  $x = B$  dalam gambar rajah berikut.



[8 marks]  
[8 markah]

SOALAN TAMAT

**FORMULA**

BASIC EXPONENT AND LOGARITHM	
$a^x = y \Leftrightarrow \log_a y = x$	
EXPONENT LAWS	LOGARITHM LAWS
$a^m \times a^n = a^{m+n}$ $\frac{a^m}{a^n} = a^{m-n}$ $(a^m)^n = a^{mn}$	$\log_a x + \log_a y = \log_a xy$ $\log_a x - \log_a y = \log_a \frac{x}{y}$ $\log_a x^n = n \log_a x$
CHANGING THE BASE	
$\log_a b = \frac{\log_c b}{\log_c a}$ $\log_a b = \frac{1}{\log_b a}$	
DIFFERENTIATION	INTEGRATION
$\frac{d}{dx}(k) = 0; \quad k = \text{constant}$ $\frac{d}{dx}(x^n) = nx^{n-1}$ $\frac{d}{dx}(\ln x) = \frac{1}{x}$ $\frac{d}{dx}(e^x) = e^x$ $\frac{d}{dx}(\sin u) = \cos u \frac{du}{dx}$ $\frac{d}{dx}(\cos u) = -\sin u \frac{du}{dx}$ $\frac{d}{dx}(\tan u) = \sec^2 u \frac{du}{dx}$ $\frac{d}{dx}(\cot u) = -\text{cosec}^2 u \frac{du}{dx}$ $\frac{d}{dx}(\sec u) = \sec u \tan u \frac{du}{dx}$ $\frac{d}{dx}(\text{cosec } u) = -\text{cosec } u \cot u \frac{du}{dx}$	$\int (k) dx = kx + c; \quad k = \text{constant}$ $\int x^n dx = \frac{x^{n+1}}{n+1} + c; \quad n \neq -1$ $\int \frac{1}{x} dx = \ln x + c$ $\int e^x dx = e^x + c$ $\int \sin x dx = -\cos x + c$ $\int \cos x dx = \sin x + c$ $\int \sec^2 x dx = \tan x + c$ $\int \text{cosec}^2 x dx = -\cot x + c$ $\int \sec x \tan x dx = \sec x + c$ $\int \text{cosec } x \cot x dx = -\text{cosec } x + c$
DIFFERENTIATION OF PRODUCT RULE	DIFFERENTIATION OF QUOTIENT RULE



$\frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx}$	$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$
<b>DIFFERENTIATION OF INVERSE TRIGONOMETRIC</b>	<b>INTEGRATION OF INVERSE TRIGONOMETRIC</b>
$\frac{d}{dx}(\sin^{-1} u) = \frac{1}{\sqrt{1-u^2}} \frac{du}{dx}$ $\frac{d}{dx}(\cos^{-1} u) = \frac{-1}{\sqrt{1-u^2}} \frac{du}{dx}$ $\frac{d}{dx}(\tan^{-1} u) = \frac{1}{1+u^2} \frac{du}{dx}$ $\frac{d}{dx}(\cot^{-1} u) = \frac{-1}{1+u^2} \frac{du}{dx}$ $\frac{d}{dx}(\sec^{-1} u) = \frac{1}{u\sqrt{u^2-1}} \frac{du}{dx}$ $\frac{d}{dx}(\operatorname{cosec}^{-1} u) = \frac{-1}{u\sqrt{u^2-1}} \frac{du}{dx}$	$\int \frac{du}{\sqrt{a^2-u^2}} = \sin^{-1} \frac{u}{a} + c$ $\int \frac{-du}{\sqrt{a^2-u^2}} = \cos^{-1} \frac{u}{a} + c$ $\int \frac{du}{a^2+u^2} = \frac{1}{a} \tan^{-1} \frac{u}{a} + c$ $\int \frac{-du}{a^2+u^2} = \frac{1}{a} \cot^{-1} \frac{u}{a} + c$ $\int \frac{du}{ u \sqrt{u^2-a^2}} = \frac{1}{a} \sec^{-1} \frac{u}{a} + c$ $\int \frac{-du}{ u \sqrt{u^2-a^2}} = \frac{1}{a} \operatorname{cosec}^{-1} \frac{u}{a} + c$
<b>AREA UNDER CURVE</b>	<b>VOLUME UNDER CURVE</b>
$A_x = \int_a^b y \, dx$ $A_y = \int_a^b x \, dy$	$V_x = \pi \int_A^B y^2 \, dx$ $V_y = \pi \int_A^B x^2 \, dy$
<b>TRIGONOMETRIC IDENTITIES</b>	<b>INTEGRATION BY PARTS</b>
$\cos^2 x + \sin^2 x = 1$ $\sec^2 x = 1 + \tan^2 x$ $\operatorname{cosec}^2 x = 1 + \cot^2 x$ $\sin 2x = 2 \sin x \cos x$ $\cos 2x = \cos^2 x - \sin^2 x$ $= 1 - 2 \sin^2 x$ $= 2 \cos^2 x - 1$ $\tan 2x = \frac{2 \tan x}{1 - \tan^2 x}$	$\int u \, dv = uv - \int v \, du$