1

SULIT

POLITEKNIK
MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN MATEMATIK, SAINS DAN KOMPUTER

PEPERIKSAAN AKHIR

**SESI DISEMBER 2014**

**DBM2013: ENGINEERING MATHEMATICS 2**

**TARIKH : 13 APRIL 2015**
**MASA : 8.30 AM - 10.30 AM (2 JAM)** ½

---

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)

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 C2

a) Express the following in the simplest form.
*Nyatakan yang berikut dalam bentuk termudah.*

i. $\dfrac{2^{(n+4)} \times 4(2^{n-1})}{2^{n}}$

[3 marks]
*[3 markah]*

ii. $4\log a + \dfrac{\log a}{2} - 2\log a$

[3 marks]
*[3 markah]*

CLO1 C3

b) Calculate the value of $x$ for the following equations.
*Kira nilai $x$ bagi setiap ungkapan-ungkapan yang berikut.*

i. $3^{x-2} = 9^{x+4}$

[4 marks]
*[4 markah]*

ii. $\log_4(5x-1) = 3$

[5 marks]
*[5 markah]*

iii. $\log(x+3) - \log 5 = \log(1-3x)$

[5 marks]
*[5 markah]*

CLO1
C4

c) Given $\log_4 3 = 0.7925$ *and* $\log_4 6 = 1.2925$ , calculate the value of

$\log_3 6 + \log_4 \sqrt{6} - \log_4 9$

*Diberi* $\log_4 3 = 0.7925$ *dan* $\log_4 6 = 1.2925$ , *kirakan nilai*

$\log_3 6 + \log_4 \sqrt{6} - \log_4 9$

[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
C3

a) Differentiate the following functions.

*Bezakan fungsi-fungsi berikut.*

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

[5 marks]

[*5 markah*]

ii. $y = e^{3x}(e^{-5x} + 7)$

[4 marks]

[*4 markah*]

iii. $y = -8(5x^4 + 3x)^{-3}$ [Use chain rule]

[Guna petua rantai]

$-8(-3)(5x^4+3x)\ d/dx(5x^4+3x)$

$24(5x^4+3x)^{-4}(20x^3+3)$

[5 marks]

[*5 markah*]

iv. $y = 7\cos^{-1} 3x$

[3 marks]

[*3 markah*]

CLO2
C4

b) Find the stationary points for the equation $y = 4x^3 + 3x^2 - 6x - 1$ and determine their nature.

*Cari titik-titik pegun bagi persamaan* $y = 4x^3 + 3x^2 - 6x - 1$ *dan tentukan sifatnya.*

[8 marks]

[*8 markah*]

**QUESTION 3**

***SOALAN 3***

CLO2 C3

a) Find $\frac{dy}{dx}$ for the following equation:

*Selesaikan* $\frac{dy}{dx}$ *bagi persamaan berikut:*

*i.* $x = 2t^4 - 2$, $y = 3\sin 4t$

[4 marks]

[*4 markah*]

*ii.* $4x - y^2 + 10xy = 2$ [Use implicit differentiation]

[*Guna pembezaan tersirat*]

[5 marks]

[*5 markah*]

iii. The surface of a sphere is increasing at a constant rate of $10\pi\ cm^2/s$. Find the rate of change of the volume when the radius is $10cm$. Given $A = 4\pi r^2$ and $V = \frac{4}{3}\pi r^3$.

*Permukaan sebuah sfera bertambah pada kadar malar* $10\pi\ cm^2/s$. *Cari kadar perubahan isipadu apabila jejarinya* $10cm$. *Diberi* $A = 4\pi r^2$ *dan* $V = \frac{4}{3}\pi r^3$.

[8 marks]

[*8 markah*]

CLO2 C4

b) Given $z = x^2 \sin y + y^2 \cos x$. Find $\frac{\partial^2 z}{\partial x \partial y}$ and $\frac{\partial^2 z}{\partial y \partial x}$.

Diberi $z = x^2 \sin y + y^2 \cos x$. Dapatkan $\frac{\partial^2 z}{\partial x \partial y}$ dan $\frac{\partial^2 z}{\partial y \partial x}$.

[8 mark]

[*8 markah*]

**QUESTION 4**

***SOALAN 4***

CLO2 C2

a) Solve the following integral.

*Selesaikan pengamiran yang berikut.*

i. $\int \frac{x^4}{2} - x + \frac{2}{x^3}\, dx$

[4 marks]

[*4 markah*]

ii. $\int 3e^{-4x} dx$

[2 marks]

[*2 markah*]

CLO2 C3

b) Integrate the following by using substitution method.

*Kamirkan yang berikut dengan menggunakan kaedah penggantian.*

i. $\int \frac{4+3x^2}{x^3+4x}\, dx$

[5 marks]

[*5 markah*]

ii. $\int 3x^2 \sec^2 x^3 dx$

[5 marks]

[*5 markah*]

iii. $\int_1^2 6x^2 (4x^3+2)^4\, dx$

V U

[9 marks]

[*9 markah*]

**QUESTION 5**

***SOALAN 5***

CLO2
C3

a) Determine the following integrals :

*Tentukan kamiran berikut :*

i. $\int \frac{1}{4+81x^2}dx$.

[4 marks]

[*4 markah*]

ii. $\int -\frac{1}{\sqrt{9-4x^2}}dx$

[5 marks]

[*5 markah*]

iii. $\int x^2 e^x dx$ [Use integration by part]

[*Guna kaedah kamiran bahagian demi bahagian*]

[ 8 marks]

[*8 markah*]

CLO2
C4

b) Solve the integration below using partial fraction method.

*Selesaikan kamiran berikut menggunakan kaedah pecahan separa.*

$$\int \frac{5x+2}{(x+1)(x+4)}dx$$

[ 8 marks]

[*8 markah*]

**SOALAN TAMAT**

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

# FORMULA DBM2013 - ENGINEERING MATHEMATICS 2

| BASIC EXPONENT AND LOGARITHM | |
|---|---|
| $a^x = y \Leftrightarrow \log_a y = x$ | |
| **EXPONENT LAWS** | **LOGARITHM LAWS** |
| $a^m \times a^n = a^{m+n}$<br>$\frac{a^m}{a^n} = a^{m-n}$<br>$(a^m)^n = a^{mn}$ | $\log_a x + \log_a y = \log_a xy$<br>$\log_a x - \log_a y = \log_a \frac{x}{y}$<br>$\log_a x^n = n \log_a x$ |
| **CHANGING THE BASE** | |
| $\log_a b = \frac{\log_c b}{\log_c a}$<br>$\log_a b = \frac{1}{\log_b a}$ | |
| **DIFFERENTIATION** | **INTEGRATION** |
| $\frac{d}{dx}(k) = 0;$ k = constant<br>$\frac{d}{dx}(x^n) = nx^{n-1}$<br>$\frac{d}{dx}(\ln x) = \frac{1}{x}$<br>$\frac{d}{dx}(e^x) = e^x$<br>$\frac{d}{dx}(\sin u) = \cos u \frac{du}{dx}$<br>$\frac{d}{dx}(\cos u) = -\sin u \frac{du}{dx}$<br>$\frac{d}{dx}(\tan u) = \sec^2 u \frac{du}{dx}$<br>$\frac{d}{dx}(\cot u) = -\operatorname{cosec}^2 u \frac{du}{dx}$<br>$\frac{d}{dx}(\sec u) = \sec u \tan u \frac{du}{dx}$<br>$\frac{d}{dx}(\operatorname{cosec} u) = -\operatorname{cosec} u \cot u \frac{du}{dx}$ | $\int (k) dx = kx + c;$ k = constant<br>$\int x^n dx = \frac{x^{n+1}}{n+1} + c : n \neq 1$<br>$\int \frac{1}{x} dx = \ln x + c$<br>$\int e^x dx = e^x + c$<br>$\int \sin x \, dx = -\cos x + c$<br>$\int \cos x \, dx = \sin x + C$<br>$\int \sec^2 x \, dx = \tan x + c$<br>$\int \operatorname{cosec}^2 x \, dx = -\cot x + c$<br>$\int \sec x \tan x \, dx = \sec x + c$<br>$\int \operatorname{cosec} x \cot x \, dx = -\operatorname{cosec} x + c$ |