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 wajib.

QUESTION 1
SOALAN 1

CLO1
C1

(a) Solve each of the following complex number in the form of $a + bi$.

Selesaikan setiap nombor kompleks berikut dalam bentuk $a + bi$.

    i. $-3(-i + 3)$

[1 mark]
[*1 markah*]

    ii. $(2i - 1) + (-1 + 5i)$

[2 marks]
[*2 markah*]

    iii. $(-5i - 3) - (2 - 6i)$

[2 marks]
[*2 markah*]

CLO1
C2

(b) Given that $p = -5 + 2i$ and $q = 6 - 3i$, find the modulus, the argument and sketch an Argand's Diagram for the following.

Diberi $p = -5 + 2i$ dan $q = 6 - 3i$, dapatkan modulus, hujahan dan lakarkan gambarajah Argand's bagi soalan berikut.

    i. p

[7 marks]
[*7 markah*]

    ii. pq

[8 marks]
[*8 markah*]

CLO1
C2

(c) Express $z = 5(\cos 30^0 + i \sin 30^0)$ in Cartesian form, exponential form and polar form.

Nyatakan $z = 5(\cos 30^0 + i \sin 30^0)$ dalam bentuk Cartesian, bentuk eksponen and bentuk polar.

[5 marks]
[*5 markah*]

POLiTEKNiK
Jabatan Pengajian Politeknik

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENGAJIAN POLITEKNIK
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN MATEMATIK, SAINS DAN KOMPUTER

PEPERIKSAAN AKHIR

SESI JUN 2013

BA201: ENGINEERING MATHEMATICS 2

TARIKH   : 28 OKTOBER 2013
TEMPOH : 2 JAM (8.30 AM - 10.30 AM)

Kertas ini mengandungi **TUJUH (07)** 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

QUESTION 3
SOALAN 3

(a) A toy car moves in a straight line from a fixed point O. Its displacement, s meter, t second after passing a fixed point O is given by $s = t^3 - 3t^2$.

Sebuah kereta mainan bergerak dalam satu garis lurus dari titik tetap O.

Sesarannya, s meter, t saat selepas melepasi titik tetap O diberi oleh $s = t^3 - 3t^2$.

CLO2
C2

i. Find the acceleration when $t = 3\ s$.

Dapatkan pecutannya apabila $t = 3\ s$.

[3 marks]
[3 *markah*]

CLO2
C2

ii. Find the acceleration when the car is instantaneously at rest.

Dapatkan pecutan apabila kereta itu dalam keadaan rehat seketika.

[3 marks]
[3 *markah*]

CLO2
C2

iii. Find the acceleration when its velocity is $24\ m/s$.

Dapatkan pecutan apabila kelajuannya adalah $24\ m/s$.

[4 marks]
[4 *markah*]

CLO2
C3

iv. Find the minimum displacement of the car.

Dapatkan sesaran minimum kereta itu.

[3 marks]
[3 *markah*]

CLO2
C3

(b) Find the coordinates of the stationary points of $y = x^3 + 2x^2 - 7x$ and determine their nature.

Dapatkan koordinat titik-titik pegun bagi $y = x^3 + 2x^2 - 7x$ dan tentukan sifat mereka.

[12 marks]
[12 *markah*]

SECTION B: 75 MARKAH
BAHAGIAN B: 75 MARKAH

INSTRUCTION:
This section consists of **FOUR (4)** structured questions. Answer **THREE (3)** questions.
ARAHAN:
*Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **TIGA (3)** soalan.*

QUESTION 2
SOALAN 2

CLO2
C1

(a) Find the derivative of the following functions.

Cari terbitan bagi fungsi-fungsi berikut.

(i) $y = -68x^2 - 4$

[2 marks]
[2 *markah*]

(ii) $y = \frac{1}{6x^4}$

[2 marks]
[2 *markah*]

(iii) $y = (x + 3)^6$

[2 marks]
[2 *markah*]

(iv) $y = 3x^4 + 2x^3 + 12x$

[3 marks]
[3 *markah*]

CLO 2
C2

(b) Differentiate the following functions with respect to x using product rule.
Bezakan fungsi-fungsi berikut terhadap x menggunakan hukum pendaraban.

(i) $y = (5x^3 + 2)(\sqrt{x} + 1)$

[3 marks]
[3 *markah*]

(ii) $y = (8x^2 + 5)(x^3 + 3)$

[4 marks]
[4 *markah*]

CLO 2
C3

(c) Using appropriate methods, differentiate the following functions with respect to x.
Dengan menggunakan kaedah-kaedah yang sesuai, bezakan fungsi-fungsi berikut terhadap x.

(i) $g(x) = 2x^3 \ln (3x - 2)$

[4 marks]
[4 *markah*]

(ii) $f(x) = (x^2 - 2e^{\sqrt{x+2}})^{10}$

[5 marks]
[5 *markah*]

CLO3

C2

(c) Given that $\int\limits_{2}^{5} f(x)\,dx = 6$. Find the value of $\int\limits_{2}^{5} [f(x)+2]\,dx$

Diberi bahawa $\int\limits_{2}^{5} f(x)\,dx = 6$ .Cari nilai bagi $\int\limits_{2}^{5} [f(x)+2]\,dx$.

[4 marks]

[*4 markah*]

CLO3

C3

(d) Evaluate $\int\limits_{0}^{1} \dfrac{12x}{3x^2+5x}\,dx$

Nilaikan $\int\limits_{0}^{1} \dfrac{12x}{3x^2+5x}\,dx$

[7 marks]

[*7 markah*]

QUESTION 4

SOALAN 4

(a) Find the following integrals.
Cari kamiran yang berikut.

CLO3

C2

    i. $\int \left(5x + 12 + \dfrac{x^3}{5} \right) dx$

[2 marks]

[*2 markah*]

CLO3

C3

    ii. $\int x(3x^2+5)\,dx$

[3 marks]

[*3 markah*]

CLO3

C3

    iii. $\int (x^2+3x)^2\,dx$

[3 marks]
[*3 markah*]

(b) Solve each of the followings.

     Selesaikan setiap yang berikut.

CLO3

C2

    i. $\int 2\sec^2 4x \, dx$

[2 marks]

[*2 markah*]

CLO3

C3

    ii. $\int 7x^2 (1-x^3)^4 \, dx$

[4 marks]

[*4 markah*]

FORMULA SHEET FOR BA201

COMPLEX NUMBER			
1.	Modulus of $z = \sqrt{a^2 + b^2}$	2.	Argument of $z = tan^{-1}\left[\dfrac{b}{a}\right]$
3.	Cartesian Form $z = a + bi$	4.	Polar Form $z = r\angle\theta$
5.	Trigonometric Form $z = r[cos\theta + isin\theta]$		Exponential Form $z = re^{i\theta}$

BASICS OF DIFFERENTIATION			
1.	$\dfrac{d}{dx}(ax^n) = anx^{n-1}$	2.	$\dfrac{d}{dx}(ax+b)^n = n(ax+b)^{n-1} \times \dfrac{d}{dx}(ax+b)$
3.	$\dfrac{dy}{dx} = \dfrac{du}{dx} \times \dfrac{dy}{du}$ [Chain Rule]	4.	$\dfrac{dy}{dx} = anu^{n-1} \times \dfrac{du}{dx}$ [Power Rule]
5.	$\dfrac{d}{dx}\left(\dfrac{u}{v}\right) = \dfrac{v\dfrac{du}{dx} - u\dfrac{dv}{dx}}{v^2}$ [Quotient Rule]	6.	$\dfrac{d}{dx}(uv) = u\dfrac{dv}{dx} + v\dfrac{du}{dx}$ [Product Rule]
7.	$\dfrac{d}{dx}(\ln x) = \dfrac{1}{x}$	8.	$\dfrac{d}{dx}[\ln(ax+b)] = \dfrac{1}{ax+b} \times \dfrac{d}{dx}(ax+b)$
9.	$\dfrac{d}{dx}(e^x) = e^x$	10.	$\dfrac{d}{dx}(e^{ax+b}) = e^{ax+b} \times \dfrac{d}{dx}(ax+b)$
11.	$\dfrac{d}{dx}(\sin x) = \cos x$	12.	$\dfrac{d}{dx}(\cos x) = -\sin x$
13.	$\dfrac{d}{dx}(\tan x) = \sec^2 x$	14.	$\dfrac{dy}{dx} = \dfrac{dy}{dt} \times \dfrac{dt}{dx}$ [Parametric Equation]
14.	$\dfrac{d}{dx}[\sin(ax+b)] = \cos(ax+b) \times \dfrac{d}{dx}(ax+b)$		
15.	$\dfrac{d}{dx}[\cos(ax+b)] = -\sin(ax+b) \times \dfrac{d}{dx}(ax+b)$		
16.	$\dfrac{d}{dx}[\tan(ax+b)] = \sec^2(ax+b) \times \dfrac{d}{dx}(ax+b)$		
17.	$\dfrac{d}{dx}[\sin^n u] = n\sin^{n-1} u \times \cos u \times \dfrac{du}{dx}$		

QUESTION 5
SOALAN 5

CLO 3
C1
C2

(a) A particle moves along a straight line from a fixed point O. Acceleration is m/s^2, given by $a = 10 - 6t$ where t is the time, in seconds, after leaving O.

    i.   Find the acceleration when $t = 4s$

    ii.   Find the velocity at time $t = 2s$

Satu zarah bergerak dari satu titik tetap O. Pecutan m/s^2, diberi $a = 10 - 6t$ dimana masa t, dalam saat selepas meninggalkan titik O.

    i.   *Kirakan pecutan apabila t=4s*

    ii.   *Kirakan halaju pada masa t=2s*

[7 marks]
[7 markah]

CLO 3
C2
C3

(b) The curve $y = x^2 + 10$ intersects the curve $y = -12x - x^2$ at the points A and B.

    i.   Find the coordinates of A and B

    ii.   Calculate the area bounded by the curves

Lengkungan $y = x^2 + 10$ bertemu dengan lengkungan $y = -12x - x^2$ pada titik-titik A dan B.

    i.   *Dapatkan koordinat bagi titik A dan B*

    ii.   *Kira luas yang dibatasi oleh lengkungan tersebut*

[12 marks]
[12markah]

CLO 3
C3

(c) Find the volume generated when an area is bounded by the curve $y = x^2 + 3$ and the coordinate $x = 0$ and $x = 3$ rotated through a complete revolution at x - axis. *Kirakan isipadu terjana apabila luas yang dibatasi oleh lengkung $y = x^2 + 3$ dan koordinat $x = 0$ dan $x = 3$ dipusingkan sepenuhnya pada paksi x.*

[6 marks]
[6 markah]

SOALAN TAMAT

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.	$V_y = \pi \int_a^b x^2\, dy$

QUADRATIC FORMULA
$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

18.	$\dfrac{d}{dx}[\cos^n u] = n\cos^{n-1} u \times -\sin u \times \dfrac{du}{dx}$		
19.	$\dfrac{d}{dx}[\tan^n u] = n\tan^{n-1} u \times \sec^2 u \times \dfrac{du}{dx}$		

BASIC OF INTEGRATION			
1.	$\int ax^n dx = \dfrac{ax^{n+1}}{n+1} + c \quad ; \{n \neq -1\}$	2.	$\int (ax+b)^n dx = \dfrac{(ax+b)^{n+1}}{(a)(n+1)} + c\; ; \{n \neq -1\}$
3.	$\int \dfrac{1}{x}\, dx = \ln x + c$	4.	$\int \dfrac{1}{ax+b}\, dx = \dfrac{1}{a} \times \ln(ax+b) + c$
5.	$\int e^x\, dx = e^x + c$	6.	$\int e^{ax+b}\, dx = \dfrac{1}{a} \times e^{ax+b} + c$
7.	$\int k\, dx = kx + c\; ; k\ is\ a\ constant$	8.	$\int \sin x\, dx = -\cos x + c$
9.	$\int \cos x\, dx = \sin x + c$	10.	$\int \sec^2 x\, dx = \tan x + c$
11.	$\int \sin(ax+b)\, dx = -\dfrac{1}{a} \times \cos(ax+b) + c$		
12.	$\int \cos(ax+b)\, dx = \dfrac{1}{a} \times \sin(ax+b) + c$		
13.	$\int \sec^2(ax+b)\, dx = \dfrac{1}{a} \times \tan(ax+b) + c$		
14.	$\int_a^b f(x)dx = [F(x)]_a^b = F(b) - F(a)$		

Identity Trigonometry			
1.	$\cos^2\theta + \sin^2\theta = 1$	2.	$\cos 2\theta = 2\cos^2\theta - 1$ $= 1 - 2\sin^2\theta$ $= \cos^2\theta - \sin^2\theta$
3.	$\sin 2\theta = 2\sin\theta\cos\theta$	4.	$\sec^2\theta = 1 + \tan^2\theta$
5.	$\tan 2\theta = \dfrac{2\tan\theta}{1 - \tan^2\theta}$	6.	$\csc^2\theta = 1 + \cot^2\theta$
7.	$a\sin\theta + b\cos\theta = R\sin(\theta + \alpha)$	8.	$a\sin\theta - b\cos\theta = R\sin(\theta - \alpha)$
9.	$a\cos\theta + b\sin\theta = R\cos(\theta - \alpha)$	10.	$a\cos\theta - b\sin\theta = R\cos(\theta + \alpha)$