

**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 yang wajib dijawab.*

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

- CLO1 (a) Given that  $P = 3 + i$  and  $Q = -2 + 3i$ , solve each of the following in the form of  $a + bi$ .  
*Diberi  $P = 3 + i$  dan  $Q = -2 + 3i$ , selesaikan setiap yang berikut dalam bentuk  $a + bi$ .*
- C1 i.  $P + Q$  [2 marks]  
 [2 Markah]
- C1 ii.  $P - Q$  [2 marks]  
 [2 Markah]
- C2 iii.  $\frac{P}{Q}$  [4 marks]  
 [4 Markah]
- CLO1 (b) Given that  $x + yi = (5 - 3i)(4 + 2i)$ , find the value of  $x$  and  $y$ .  
 C2 *Diberi  $x + yi = (5 - 3i)(4 + 2i)$ , dapatkan nilai bagi  $x$  dan  $y$ .*
- [4 marks]  
 [4 Markah]
- CLO1 (c) Find the modulus, argument and sketch an Argand's diagram for the complex  
 C2 number  $3 - 7i$ .  
*Dapatkan modulus, hujah dan lakarkan rajah Argand bagi nombor kompleks  $3 - 7i$ .*
- [4 marks]  
 [4 Markah]

SULIT

**POLITEKNIK**  
 Jabatan Pengajian Politeknik

BAHAGIAN PEPERIKSAAN DAN PENILAIAN  
 JABATAN PENGAJIAN POLITEKNIK  
 KEMENTERIAN PENGAJIAN TINGGI

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI DISEMBER 2012

**BA201: ENGINEERING MATHEMATICS II**

TARIKH : 22 APRIL 2013 (ISNIN)

TEMPOH : 2 JAM (2.30 - 4.30) PM

Kertas ini mengandungi **SEBELAS (11)** halaman bercetak.  
 Bahagian A: Struktur (1 soalan)  
 Bahagian B: Struktur (4 soalan-jawab 3 soalan)  
 Dokumen sokongan yang disertakan : Kertas Graf dan Formula

**JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN**

(CLO yang tertera hanya sebagai rujukan)

**SULIT**

**SECTION B: 75 MARKS**  
**BAHAGIAN B: 75 MARKS**

**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**

CLO 2  
C2

- (a) Differentiate the followings with respect to  $x$ .

Bezakan semua yang berikut terhadap  $x$ .

i.  $y = (8 + x^3)(x^3 - 8)$

[3 marks]  
[3 markah]

ii.  $y = \frac{3x-2}{x^2}$

[5 marks]  
[5 markah]

iii.  $y = \sqrt{x+5}$

[3 marks]  
[3 markah]

CLO 2  
C2

- (b) Find  $\frac{dy}{dx}$  of the following parametric equations.

Cari  $\frac{dy}{dx}$  bagi persamaan berparameter berikut.

$$x = 3t - 2 \text{ and } y = t^3$$

[4 marks]  
[4 markah]

CLO1  
C2

- (d) Given that  $Z_1 = 10\angle 30^\circ$  and  $Z_2 = 15(\cos 20^\circ + i \sin 20^\circ)$ . Find  $Z_1 \times Z_2$  in the Trigonometric form.

Diberi  $Z_1 = 10\angle 30^\circ$  dan  $Z_2 = 15(\cos 20^\circ + i \sin 20^\circ)$ . Dapatkan  $Z_1 \times Z_2$  dalam bentuk Trigonometri.

[4 marks]

[4 Markah]

CLO1  
C2

- (e) Solve the multiplication and division problem for the following expression in Trigonometric form.

Selesaikan masalah pendaraban dan pembahagian yang berikut kepada bentuk Trigonometri.

$$\frac{5 (\cos 150^\circ + i \sin 150^\circ) \times 4 (\cos 20^\circ + i \sin 20^\circ)}{5 (\cos 60^\circ + i \sin 60^\circ)}$$

[5 marks]

[5 Markah]

## QUESTION 3

## SOALAN 3

CLO2  
C2

- (a) A lorry is moving from a stationary state and moves to a distance  $s$  meter on a straight line in  $t$  seconds. Given that  $s = t^3 + 3t^2$ .

*Sebuah lori bergerak dari keadaan pegun ke kedudukan  $s$  meter di atas garis lurus dalam  $t$  saat. Diberi bahawa  $s = t^3 + 3t^2$ .*

- i. Find acceleration  $a$  after 4 seconds.  
*Cari pecutan  $a$  selepas 4 saat.*

[3 marks]  
[3 markah]

- ii. Find time  $t$  when velocity is 45 m/s .  
*Cari masa  $t$  apabila halaju adalah 45 m/s .*

[3 marks]  
[3 markah]

CLO2  
C3

- (b) Given  $y = 3x^2 - 6x + 2$  represents a curve line.

*Diberi persamaan  $y = 3x^2 - 6x + 2$  mewakili satu garis lengkung.*

- i. Find the turning point of the curve line.  
*Tunjukkan titik pusingan bagi garis lengkung tersebut.*

[5 marks]  
[5 markah]

- ii. Find the nature of the turning point.  
*Tunjukkan sifat titik pusingan tersebut.*

[4 marks]  
[4 markah]

CLO 2  
C3

- (c) Given  $y = 3x^4 + 2x^2 - \frac{1}{x} + 2$ , find the value of  $\frac{dy}{dx}$  if  $x = 2$ .

*Diberi  $y = 3x^4 + 2x^2 - \frac{1}{x} + 2$ , cari nilai bagi  $\frac{dy}{dx}$  apabila  $x = 2$ .*

[5 marks]  
[5 markah]

CLO 2  
C3

- (d) Let  $y = \frac{4x^3 - 7x}{5x^2 + 2}$ . Find  $\frac{dy}{dx}$  by using the Quotient Rule.

*Katakan  $y = \frac{4x^3 - 7x}{5x^2 + 2}$ . Cari  $\frac{dy}{dx}$  dengan menggunakan Petua Hasil Bahagi.*

[5 marks]  
[5 markah]

## QUESTION 4

## SOALAN 4

(a) Find the following integrals.

*Kamirkan fungsi-fungsi berikut.*

- CLO3  
C1
- i.  $\int 9 - 5x + x^2 dx$  [3 marks]  
[3 markah]
- CLO3  
C2
- ii.  $\int \frac{10}{3}x^4 + \frac{1}{\sqrt[3]{x^2}} - 7 dx$  [4 marks]  
[4 markah]
- CLO3  
C2
- iii.  $\int 3\sqrt{4x-1} dx$  [4 marks]  
[4 markah]
- CLO3  
C3
- iv.  $\int \frac{1}{3} \sin(5-2\theta) d\theta$  [3 marks]  
[3 markah]
- CLO3  
C3
- v.  $\int 12 e^{1-2x} dx$  [3 marks]  
[3 markah]

(b) Evaluate the following integral by using the substitution method.

*Nilaikan kamiran berikut menggunakan kaedah gentian.*

- CLO3  
C3
- $\int_1^2 \frac{x^2+1}{x^3+3x} dx$  [8 marks]  
[8 markah]

CLO2  
C3

(c) The surface of a sphere is decreasing at a constant rate of  $4\pi \text{ cm}^2/\text{s}$ .

*Permukaan sebuah sfera berkurangan pada kadar malar  $4\pi \text{ cm}^2/\text{s}$ .*

i. Find the rate of change of radius,  $\frac{dr}{dt}$  when its radius is 8 cm.

*Cari perubahan kadar jejari,  $\frac{dr}{dt}$  apabila jejarinya 8 cm.*

[5 marks]  
[5 markah]

ii. Hence, find the rate of change of volume,  $\frac{dV}{dt}$ .

*Seterusnya, cari kadar perubahan isipadu,  $\frac{dV}{dt}$ .*

[5 marks]  
[5 markah]

- CLO3 (b) Figure 2 shows the graphs of  $y = x^2$  and  $y = 2 - x^2$ .

Rajah 2 menunjukkan graf  $y = x^2$  and  $y = 2 - x^2$ .

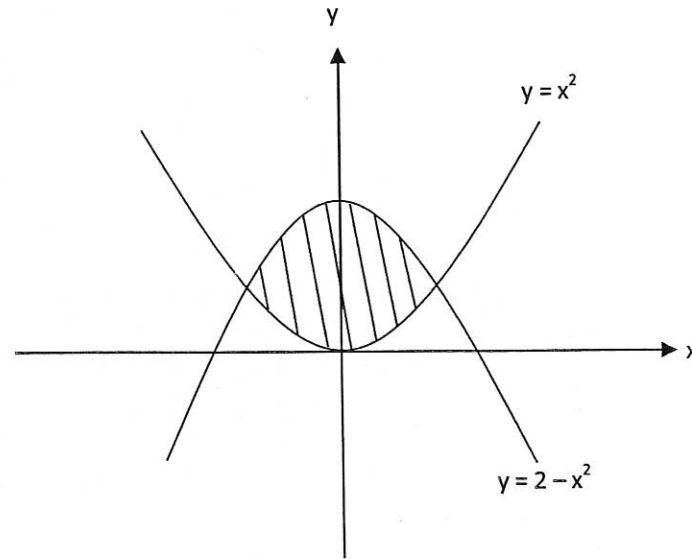


Figure 2/ Rajah 2

Calculate:

Kirakan :

- C2 i. the intersection point between curve  $y = x^2$  and  $y = 2 - x^2$ .

titik persilangan di antara lengkok  $y = x^2$  and  $y = 2 - x^2$ .

[3 marks]

[3 markah]

- C3 ii. the shaded area.

luas permukaan berlorek.

[4 marks]

[4 markah]

QUESTION 5

SOALAN 5

CLO3  
C3

- (a) Figure 1 shows a region enclosed by a curve  $PTQ$ , where  $y = 18 - x^2$  and the line  $PQ$ , where  $y = 2$ , between  $x = -4$  and  $x = 4$ .  $PQRS$  is a rectangle. Calculate the area of the shaded region.

Rajah 1 berikut menunjukkan satu kawasan yang tertutup antara lengkok  $PTQ$ , di mana  $y = 18 - x^2$  dan satu garis lurus  $PQ$ , di mana  $y = 2$  di antara  $x = -4$  dan  $x = 4$ .  $PQRS$  adalah sebuah segi empat tepat. Kirakan luas permukaan berlorek.

[ 8 marks]

[8 markah]

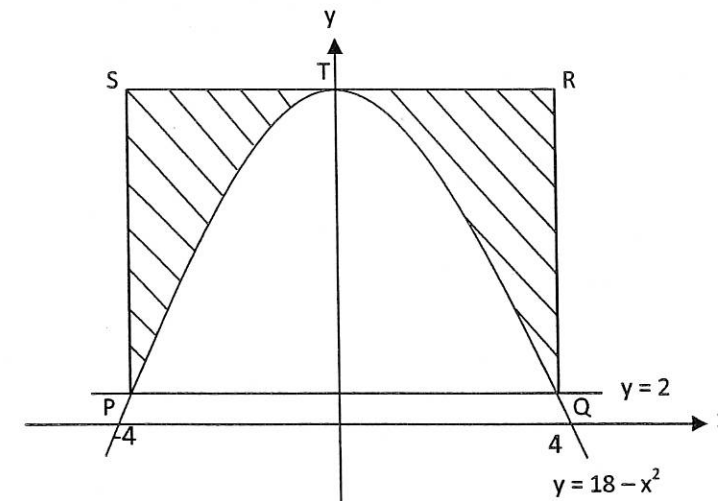


Figure 1/ Rajah 1

BASICS OF DIFFERENTIATION		
1. $\frac{d}{dx}(x^n) = nx^{n-1}$	2. $\frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx}$	3. $\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$
4. $\frac{d}{dx}(\ln x) = \frac{1}{x}$	5. $\frac{d}{dx}(a^x) = a^x \ln a$	6. $\frac{d}{dx}(e^x) = e^x$
7. $\frac{d}{dx}(\sin x) = \cos x$	8. $\frac{d}{dx}(\cos x) = -\sin x$	9. $\frac{d}{dx}(\tan x) = \sec^2 x$
10. $\frac{d}{dx}(\cot x) = -\operatorname{cosec}^2 x$	11. $\frac{d}{dx}(\sec x) = \sec x \tan x$	12. $\frac{d}{dx}(\operatorname{cosec} x) = -\operatorname{cosec} x \cot x$
BASICS OF INTEGRATION		
1. $\int x^n dx = \frac{x^{n+1}}{n+1} + c \{n \neq -1\}$	2. $\int \frac{1}{x} dx = \ln x + c$	3. $\int e^x dx = e^x + c$
4. $\int a^x dx = \frac{a^x}{\ln a} + c$	5. $\int \sin x dx = -\cos x + c$	6. $\int \cos x dx = \sin x + c$
7. $\int \sec^2 x dx = \tan x + c$		
AREA UNDER A CURVE		
1. $A_x = \int_a^b y dx$	2. $A_y = \int_a^b x dy$	
VOLUME UNDER A CURVE		
1. $V_x = \pi \int_a^b y^2 dx$	2. $V_y = \pi \int_a^b x^2 dy$	
THE ROOTS OF QUADRATIC EQUATION		
$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$		

C3

iii. the volume of solid generated when the shaded area is rotated  $360^\circ$  through  $x$ -axis.

*isipadu pepejal yang terbentuk apabila luas permukaan berlorek berputar  $360^\circ$  mengelilingi paksi  $x$ .*

[5 marks]

[5 markah]

CLO3  
C2

(c) An object is moving straight line and through fixed point, O. It's constant acceleration,  $a \text{ ms}^{-2}$ , is given by  $a = 10t - 4$ .

*Sebuah objek bergerak secara lurus dan melalui satu titik tetap, O. Persamaan pecutan tetap kereta,  $a \text{ ms}^{-2}$  diberi oleh  $a = 10t - 4$ .*

i. Calculate the acceleration of particle at time  $t = 5s$ .

*Kirakan pecutan objek pada masa  $t = 5s$ .*

[2 marks]

[2 markah]

ii. Find the velocity of object in term of  $t$ .

*Dapatkan persamaan halaju dalam sebutan  $t$ .*

[3 marks]

[3 markah]

SOALAN TAMAT

END OF PAPER

## TRIGONOMETRY IDENTITIES

- |   |   |  |
|---|---|--|
| 1. $\sin^2 \theta + \cos^2 \theta = 1$                        | 2. $\sec^2 \theta = 1 + \tan^2 \theta$  | 3. $\operatorname{cosec}^2 \theta = 1 + \cot^2 \theta$       |
| 4. $\sin 2\theta = 2 \sin \theta \cos \theta$                 | 5. $\cos 2\theta = \cos^2 \theta - \sin^2 \theta$<br>$= 1 - 2\sin^2 \theta$<br>$= 2\cos^2 \theta - 1$ | 6. $\tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$  |
| 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. $a \cos \theta - b \sin \theta = R \cos(\theta + \alpha)$ |   |  |