SECTION A : 50 MARKS

BAHAGIAN A : 50 MARKAH

INSTRUCTION:

This section consists of **THREE (3)** structured questions. Answer **TWO (2)** questions only.

ARAHAN:

*Bahagian ini mengandungi **TIGA (3)** soalan berstruktur. Jawab **DUA (2)** soalan sahaja.*

QUESTION 1

SOALAN 1

CLO 1

C1

a) Simplify the following expressions to the lowest term.

Permudahkan ungkapan berikut kepada sebutan terendah.

i. $\dfrac{4+16m}{12-24m}$

[2 marks]

[2 markah]

ii. $\dfrac{2x}{a^2b}+\dfrac{y}{bc^2}$

[2 marks]

[2 markah]

iii. $\dfrac{2p+q}{a}\div\dfrac{4p+2q}{2a^2}$

[3 marks]

[3markah]

POLITEKNIK
Jabatan Pengajian Politeknik

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENGAJIAN POLITEKNIK
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN MATEMATIK, SAINS DAN KOMPUTER

PEPERIKSAAN AKHIR

SESI JUN 2013

BA101: ENGINEERING MATHEMATICS 1

TARIKH   : 28 OKTOBER 2013
TEMPOH   : 2 JAM (2.30 PM - 4.30 PM)

Kertas ini mengandungi **EMPAT BELAS (14)** halaman bercetak.
Bahagian A: Struktur (3 soalan)
Bahagian B: Struktur (3 soalan)
Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

QUESTION 2

SOALAN 2

CLO1
C1

a) Find the value of the following expressions and express your answer in standard form.

Cari nilai bagi ungkapan berikut dan nyatakan jawapan anda dalam bentuk piawai.

  i. $6.12 \times 10^8 + 2.5 \times 10^9$

[3 marks]

[3 markah]

  ii. $(3.2 \times 10^{-4})(4.4 \times 10^6)$

[3 marks]

[3 markah]

CLO1
C1

b) Simplify each of the following indices.

Pemudahkan setiap indek berikut.

  i. $2^{3x} \times 2^{-2x} \div 2^{-4x}$

[4 marks]

[4 markah]

  ii. $9^{n+3} \times 27 \div 3^{7-n}$

[4 marks]

[4 markah]

CLO1
C2

c) Given that $\log_5 3 = 0.6826$ and $\log_5 6 = 1.1133$. Find the value of $\log_5 90$ without using a calculator.

Diberi $\log_5 3 = 0.6826$ dan $\log_5 6 = 1.1133$. Cari nilai bagi $\log_5 90$ tanpa menggunakan kalkulator.

[3 marks]

[3 markah]

CLO 1
C1

b) Given that $s = ut + \frac{1}{2}at^2$, express u as the subject.

Diberi $s = ut + \frac{1}{2}at^2$, jadikan u sebagai perkara rumus.

[3 marks]

[3 markah]

CLO 1
C3

c) Solve the following quadratic equations.

Selesaikan persamaan kuadratik berikut.

  i. $3x^2 + 7x + 3 = 0$ Using the quadratic formula.

[6 marks]

[6 markah]

  ii. $x^2 = x + 12$ Using the factorization method.

[3 marks]

[3 markah]

CLO 1
C3

d) Solve the following simultaneous linear equations by using the substitution method.

Selesaikan persamaan serentak yang berikut dengan menggunakan kaedah gantian.

$$\frac{x}{2} + \frac{y}{3} = 0$$
$$2x - 3x = 26$$

[6 marks]

[6 markah]

QUESTION 3

SOALAN 3

CLO1
C2

a) For each of the following trigonometric functions, determine its reference angle. Hence, find the value of the trigonometric function.

Hitungkan sudut rujukan bagi setiap fungsi trigonometri berikut dan tentukan nilai fungsi trigonometri tersebut.

i. $\sin 136°$

[3 marks]

[3 markah]

ii. $\cos(-25°)$

[3 marks]

[3 markah]

iii. $\tan(300°)$

[3 marks]

[3 markah]

CLO1
C3

b) Solve the following trigonometric equation for $0° \le \theta \le 360°$.

Selesaikan persamaan trigonometri berikut bagi $0° \le \theta \le 360°$.

$$2\cos\theta - \csc\theta = 1$$

[8 marks]

[8 markah]

CLO1
C1

d) Find the values for each of the following logarithm.

Cari nilai bagi setiap logaritma berikut.

i. $\log_{\sqrt{4}} 4^{\frac{1}{2}}$

[2 marks]

[2 markah]

ii. $5\log_{\frac{2}{3}} \frac{2}{3}$

[2 marks]

[2 markah]

CLO1
C3

e) Solve the equation $\log_5(2x-3) - \log_5(x-1) = 1$.

Selesaikan persamaan $\log_5(2x-3) - \log_5(x-1) = 1$.

[4 marks]

[4 markah]

SECTION B : 50 MARKS
BAHAGIAN B : 50 MARKAH

INSTRUCTION:

This section consists of **THREE (3)** structured questions. Answer **TWO (2)** questions only

ARAHAN:

*Bahagian ini mengandungi **TIGA (3)** soalan berstruktur. Jawab **DUA (2)** soalan sahaja.*

QUESTION 4
SOALAN 4

CLO2
C1

a) State the type of angles below.

Nyatakan jenis-jenis sudut di bawah.

   i. $80°$

   ii. $235°$

   iii. $114°$

[3 marks]

[*3 markah*]

CLO2
C2

b) In Figure 4(b)(i) and 4(b)(ii), find the values of x and y.
   Dalam Rajah 4(b)(i) dan 4(b)(ii), carikan nilai bagi x dan y.

[4 marks]

[*4 markah*]

   i)

Figure 4(b)(i) / *Rajah 4(b)(i)*

CLO1
C3

c) In Figure 3C, *QRS* is a straight line. Given that *PS* = 16cm, *QR* = 10 cm, *RS* = 16cm, ∠*PRS* = 43°, and ∠*RPS* = 77°. Calculate,

Merujuk kepada Rajah 3C,QSR ialah garis lurus. Diberi PS = 16cm, QR=10 cm,RS=16cm, ∠PRS = 43°, dan ∠RPS = 77°. Kirakan,
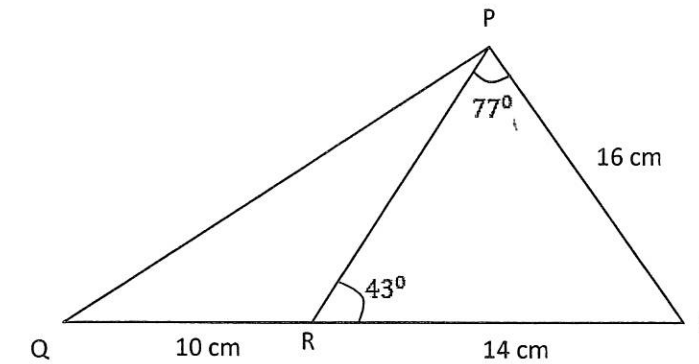

Figure 3C/ *Rajah 3C*

   i.   ∠*PSR*

[1 mark]

[*1 markah*]

   ii. Length of *PQ*

        Panjang PQ

[7 marks]

[*7 markah*]

CLO2
C2

d) In Figure 4(d), *AD* is the diameter of the circle and the tangent *BC* touches the circle at *B*. Given $\angle BOD = 60°$. Calculate *x* and *y*

Dalam Rajah 4(d), AD ialah diameter bagi bulatan tersebut dan tangen BC menyentuh bulatan di B. Diberi $\angle BOD = 60°$. Kirakan x dan y.
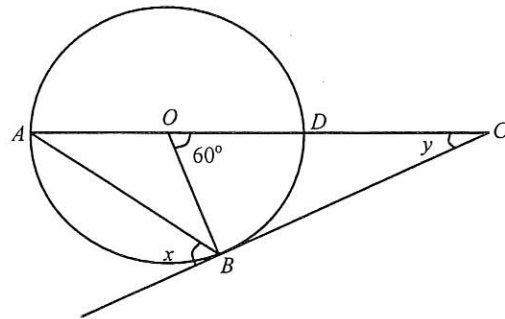
[5 marks]
[*5 markah*]

Figure 4(d) / *Rajah 4(d)*

CLO2
C3

e) Figure 4(e) shows a square *ABCE*. Given the area of the square is 144 cm^2. Calculate the value of *x*.

Rajah 4(e) menunjukkan sebuah segiempat sama ABCE dan diberi luasnya ialah 144 cm^2. Kirakan nilai bagi x.
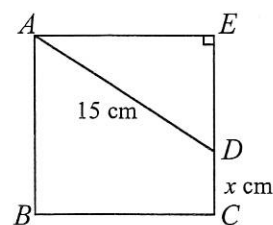
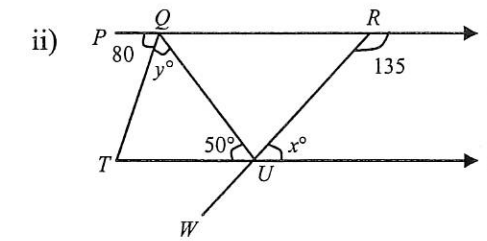Figure 4(e) / *Rajah 4(e)*

[5 marks]
[*5 markah*]

ii)

[4 Marks]
[*4 markah*]

Figure 4(b)(ii) / *Rajah 4(b)(ii)*

CLO2
C2

c) In Figure 4(c), calculate the value of *x* and *y* .

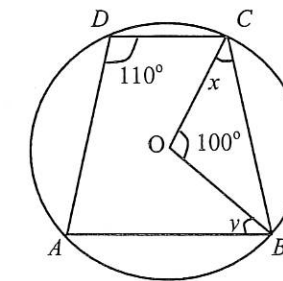*Dalam Rajah 4(c), kirakan nilai bagi x dan y .*

[4 marks]
[*4 markah*]

Figure 4(c) / *Rajah 4(c)*

CLO2
C3

c) Diagram 5c shows half of a solid cylinder. If the total surface area of the solid

d) cylinder is 874 cm², find the value of p. Use $\pi = \dfrac{22}{7}$.

Rajah 5c menunjukkan sebuah separa selinder. Jika jumlah luas permukaan objek

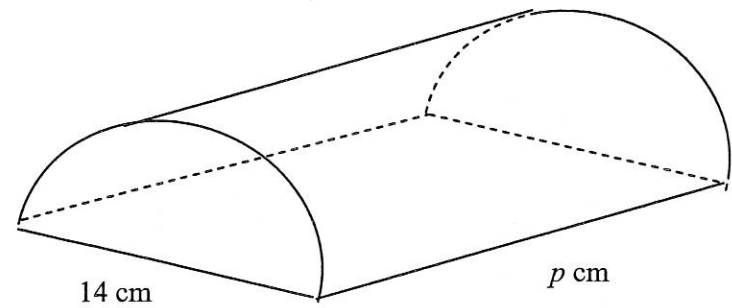*tersebut ialah 874 cm², kirakan nilai p. Use $\pi = \dfrac{22}{7}$.*

14 cm

p cm

Diagram 5c/*Rajah 5c*

[6 marks]

[6 markah]

CLO2
C3

e) Diagram 5d shows two rectangular boxes of similar shapes. Given that the dimensions of the smaller box are 4cm× 3cm× 5cm and the width of the larger box is 9 cm. Find the volume of the larger box.

Rajah 5d menunjukkan dua buah kotak segiempat yang serupa. Diberi ukuran

bagi kotak kecil ialah 4cm× 3cm× 5cm dan ukuran lebar kotak yang besar 9 cm.

Dapatkan isipadu kotak yang besar.

5cm
3cm
4cm
9cm

Diagram 5d /*Rajah 5d*

[6 marks]

[6 markah]

QUESTION 5

SOALAN 5

CLO2
C2

a) Diagram 5a shows a sector *OKL*. Calculate the perimeter of the sector. Use $\pi = \dfrac{22}{7}$.

Rajah 5a menunjukkan sektor OKL. Kirakan perimeter sektor tersebut. Gunakan $\pi = \dfrac{22}{7}$.
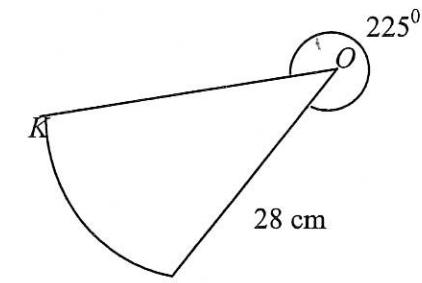
[6 marks]

[6 markah]

225⁰

O

K

28 cm

L

Diagram 5a/*Rajah 5a*

CLO2
C3

b) In diagram 5b, *JKLM* is a rectangle. *KX* is a circular sector with center L. Find the area of the shaded region. Use $\pi = \dfrac{22}{7}$.

Dalam Rajah 5b, JKLM ialah segiempat tepat. KX ialah sukuan yang berpusat di

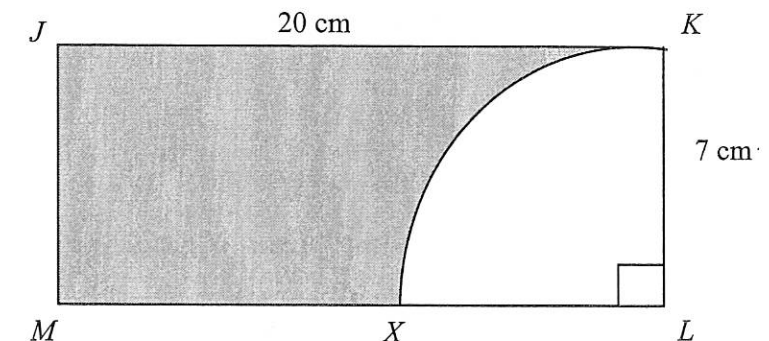*L. Dapatkan luas rantau yang berlorek. Gunakan* $\pi = \dfrac{22}{7}$.

J 20 cm K

7 cm

M X L

Diagram 5b/*Rajah 5b*

[7 marks]

[7 markah]

x	-4	-3	-2	-1	0	1	2	3
y	-11	-4			5		1	

iii)   By using a scale of 2 cm to 1 unit on the *x*-axis and 2 cm to 1 unit on the *y*-axis, draw the graph $y = 5 - x^2$ for the values of *x* in the range $-4 \leq x \leq 3$.

Dengan menggunakan skala 2 cm kepada 1 unit pada paksi-x dan 2 cm kepada 1 unit pada paksi- y, lukiskan graf $y = 5 - x^2$ untuk nilai x pada julat $-4 \leq x \leq 3$.

[4 marks]

[*4 markah*]

iv)   Then, draw a straight line $2x - y - 1 = 0$.

Kemudian, lukiskan satu garis lurus $2x - y - 1 = 0$.

[3 marks]

[*3 markah*]

v)   From your graph, find the intersection points.

Daripada graf, dapatkan titik-titik persilangan.

[3 marks]

[*3 markah*]

QUESTION 6
SOALAN 6

CLO2
C1

a)   Given P(3,-1) and Q(4,5). Find the,

Diberi P(3,-1) dan Q(4,5). Tentukan,

i)   Gradient, of line *PQ*

Kecerunan garis PQ

[2 marks]

[*2 markah*]

ii)   Distance between point P and Q

Jarak di antara titik P dan Q

[2 marks]

[*2 markah*]

CLO2
C3

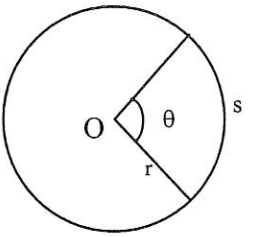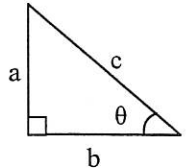b)   i)   Complete the table below with the values of *y* for the function $y = 5 - x^2$.

Lengkapkan jadual di bawah dengan nilai y untuk fungsi $y = 5 - x^2$.

[4 marks]

[*4 markah*]

FORMULA SHEET FOR ENGINEERING MATHEMATICS (BA101)

INDICES AND LOGARITHM

Basic of Index and Logarithm

1. $y = a^x \leftrightarrow x = \log_a y$

Rules of Index

1. $a^m \times a^n = a^{m+n}$

5. $\left(\dfrac{a}{b}\right)^n = \dfrac{a^n}{b^n}$, $b \neq 0$

2. $\dfrac{a^m}{a^n} = a^{m-n}$

6. $a^{-n} = \dfrac{1}{a^n}$, $a \neq 0$

3. $\left(a^m\right)^n = a^{mn}$

7. $a^{\frac{m}{n}} = \sqrt[n]{a^m}$

4. $(ab)^n = a^n b^n$

Rules of Logarithm

1. $\log_a MN = \log_a M + \log_a N$
2. $\log_a \dfrac{M}{N} = \log_a M - \log_a N$
3. $\log_a N^P = P \log_a N$

FORMULA OF TRIANGLE

Sine Rules $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Cosine Rules $a^2 = b^2 + c^2 - 2bc \cos A$

Area of Triangle $= \dfrac{1}{2}$ a b sin C

TRIGONOMETRY

Pythagoras' Theorem

$c^2 = a^2 + b^2$

Trigonometric Identities

$\tan \theta = \dfrac{\sin \theta}{\cos \theta}$

$\cos^2 \theta + \sin^2 \theta = 1$

$1 + \tan^2 \theta = \sec^2 \theta$

$1 + \cot^2 \theta = \csc^2 \theta$

Compound-angle

$\sin (A \pm B) = \sin A \cos B \pm \cos A \sin B$
$\cos (A \pm B) = \cos A \cos B \mp \sin A \sin B$
$\tan (A \pm B) = \dfrac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$

Double-angle

$\sin 2A = 2 \sin A \cos A$
$\cos 2A = \cos^2 A - \sin^2 A$
$= 1 - 2 \sin^2 A$
$= 2 \cos^2 A - 1$
$\tan 2A = \dfrac{2 \tan A}{1 - \tan^2 A}$

MEASUREMENT

Arc Length of a Circle

$s = r\theta$

Area of a Sector

$A = \dfrac{1}{2} r^2 \theta$

Area of a Segment

$A = \dfrac{1}{2} r^2 \theta - \dfrac{1}{2} r^2 \sin \theta$

SURFACE AREA AND VOLUME

Cylinder : $A = 2\pi r h + 2\pi r^2$
$V = \pi r^2 h$

Cone : $A = \pi r s + \pi r^2$
$V = \dfrac{1}{3} \pi r^2 h$

Sphere : $A = 4\pi r^2$
$V = \dfrac{4}{3} \pi r^3$

Pyramid : A = area of four triangles + area of base

V = (1/3) x (area of base) x (height)

GRAPH

$y = ax^2 + bx + c$, $a \neq 0$

$m = \dfrac{y_2 - y_1}{x_2 - x_1}$

$y = mx + c$

$Mid\ point = \left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2}\right)$

$Distance = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$Vertex, x = -\dfrac{b}{2a}$

SOLVING QUADRATIC EQUATION

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

2. $\left(x + \dfrac{b}{2}\right)^2 - \left(\dfrac{b}{2}\right)^2 + c = 0$

CLO2
C3

d) Sketch the graph for each of the following functions.

Lakarkan graf untuk setiap fungsi berikut.

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

[3 marks]

[3 markah]

ii) $y = \dfrac{6}{x}$

[2 marks]

[2 markah]

iii) $y = -\dfrac{7}{x}$

[2 marks]

[2 markah]

SOALAN TAMAT