

CONFIDENTIAL



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESI 2014/2015**

COURSE NAME : MATHEMATICS I

COURSE CODE : BBM 10303

CODE PROGRAMME : 1BBE/ 1BBU/ 1BBD/ 1BBB/ 1BBF

DATE : DECEMBER 2014 /JANUARY 2015

DURATION : 3 HOURS

INSTRUCTION : ANSWER FIVE QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF SEVEN (7) PAGES

CONFIDENTIAL

- S1 (a) Find the distance between the points given:

Cari jarak antara titik –titik yang diberi:

- (i) A(2,-2) and B(-4,-5).
 (ii) R(-2,0) and S(3,-12).

(4 marks)

- (b) Find the equation of the straight line that passes through the point R(3,5) and S(6,4), expressing the answer in each of the following forms.

Dapatkan persamaan garis lurus yang melalui titik R(3,5) dan S(6,4), nyatakan jawapan dalam bentuk berikut.

- (i) Gradient form.
Persamaan kecerunan.
 (ii) General form.
Persamaan am.

(4 marks)

- (c) Find the equation of the straight line that passes through the point (-1,3) and is parallel to the straight line $5x - 2y - 1 = 0$.

Cari persamaan garis lurus yang melalui titik (-1,3) dan selari dengan garis lurus $5x - 2y - 1 = 0$.

(5 marks)

- (d) Given A(2,1), B(4,9), P(1,6) and Q(6,-1) respectively. Find the equation of the straight line that passes through the midpoint of AB and is perpendicular to the straight line PQ.

Diberi A(2,1), B(4,9), P(1,6) dan Q(6,-1). Cari persamaan garis lurus yang melalui titik tengah AB dan ia berserenjang dengan garis lurus PQ.

(7 marks)

- S2 (a) Find the factors for the following quadratic equations:

Cari punca-punca persamaan kuadratik berikut:

(i) $\frac{1}{2}x^2 + 5x = -\frac{7}{2}$

(ii) $0.01x^2 - 0.06x + 0.09 = 0$

(iii) $10000x^2 + 20000x + 50000 = 0$

(12 marks)

- (b) Figure S2(b) shows that a garden measuring 12 meters by 16 meters is to have a pedestrian pathway installed all around it, increasing the total area to 285 square meters. What will be the width of the pathway?

Rajah S2(b) menunjukkan sebuah taman yang bersaiz 12meter lebar dan 16meter panjang mempunyai lorong mengelilinginya. Luas permukaan keseluruhan kawasan tersebut adalah 285m². Hitung lebar lorong (x) yang mengelilingi taman tersebut.

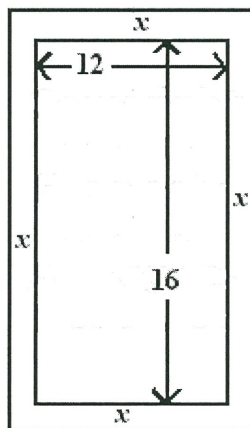


Figure S2

(8 marks)

- S3 (a) Solve the inequality $\frac{(x-4)(3x+2)}{(x-3)} \leq 0$.

Selesaikan ketaksamaan $\frac{(x-4)(3x+2)}{(x-3)} \leq 0$.

(8 marks)

- (b) Express the equation in partial fraction

Nyatakan persamaan berikut kepada pecahan separa

(i) $\frac{2x^2 - 7}{(x+1)(x-3)^2}$

(ii) $\frac{2x^2 + 1}{(x+1)(x^2 + x + 2)}$

(12 marks)

- S4** (a) Given $\sin \theta = 4/5$ and $\cos \alpha = 5/12$. Without using calculator, find the values for the following:

Diberi $\sin \theta = 4/5$ and $\cos \alpha = 5/12$. Cari nilai-nilai yang berikut tanpa menggunakan kalkulator:

(i) $\cos \theta$

(ii) $\tan \theta$

(iii) $\sin \alpha$

(6 marks)

- (b) Given $\sin 45^\circ = \frac{\sqrt{2}}{2}$, $\cos 45^\circ = \frac{\sqrt{2}}{2}$, $\sin 60^\circ = \frac{\sqrt{3}}{2}$ and $\cos 60^\circ = \frac{1}{2}$. Without using calculator, determine the values for the following:

Diberi $\sin 45^\circ = \frac{\sqrt{2}}{2}$, $\cos 45^\circ = \frac{\sqrt{2}}{2}$, $\sin 60^\circ = \frac{\sqrt{3}}{2}$ dan $\cos 60^\circ = \frac{1}{2}$. Tentukan nilai-nilai yang berikut tanpa menggunakan kalkulator.

(i) $\sin 15^\circ$

(ii) $\cos 105^\circ$

(iii) $\tan 15^\circ$

(9 marks)

- (c) Prove:

Buktikan:

$$\sec^2 x + \csc^2 x = \sec^2 x \cdot \csc^2 x$$

(5 marks)

- S5 (a) Given Q is the inverse matrices of P , calculate the value of x, y, z .

Diberi Q adalah matriks songsang bagi P , hitungkan nilai x, y, z .

$$P = \begin{bmatrix} 1 & 2 & -1 \\ 3 & 5 & 3 \\ 2 & 4 & 3 \end{bmatrix} \quad Q = \begin{bmatrix} x & 2 & \frac{-11}{6} \\ \frac{3}{5} & -1 & y \\ \frac{-2}{5} & 0 & z \end{bmatrix}$$

(10 marks)

- (b) Solve the following equation using Gauss Elimination.

Selesaikan persamaan berikut menggunakan Kaedah Penghapusan Gauss.

$$\begin{aligned} x + y + z &= 5 \\ 2x + 3y + 5z &= 8 \\ 4x + 5z &= 2 \end{aligned}$$

(10 marks)

- S6 (a) Simplify the following expressions:

Permudahkan ungkapan berikut:

$$\begin{aligned} \text{(i)} \quad & (2 + 4i)(13i - 5i) \\ \text{(ii)} \quad & (2 - 5i)^2 \\ \text{(iii)} \quad & -\frac{1}{i} + \left(\frac{1+i}{1-i}\right)^2 \end{aligned}$$

(9 marks)

- (b) Given $z_1 = 2 - i$, and $z_2 = -2 + 3i$, find the following expressions in polar form.

Diberi $z_1 = 2 - i$, dan $z_2 = -2 + 3i$, cari ungkapan berikut dalam bentuk kutub.

$$\begin{aligned} \text{(i)} \quad & (z_1/z_2) \\ \text{(ii)} \quad & z_1 z_2 \end{aligned}$$

(6 marks)

- (c) Let $z = (1 + \sqrt{3}i)$, find z^6 .

Biar $z = (1 + \sqrt{3}i)$, cari z^6 .

(5 marks)

S7 (a) Given $v = -2i + j + 4k$ and $w = i + 2j - 3k$. Find

Diberi $v = -2i + j + 4k$ dan $w = i + 2j - 3k$. Cari

(i) $v + 2w$

(ii) $|3v - w|$

(i) $|v| - |w|$

(9 marks)

(b) Jika $a = 2\hat{i} - 2\hat{j} + 3\hat{k}$, $b = 5\hat{i} + 8\hat{j} + \hat{k}$ and $c = -4\hat{i} + 3\hat{j} - 2\hat{k}$,
find $a \cdot b$ dan $a \cdot (b + c)$.

(6 marks)

(c) Find $p \times q$ and $q \times p$ for vectors $p = 3\hat{i} + 4\hat{j}$ and $q = \hat{i} + 5\hat{j} - 2\hat{k}$.
Cari $p \times q$ dan $q \times p$ untuk vektor $p = 3\hat{i} + 4\hat{j}$ dan $q = \hat{i} + 5\hat{j} - 2\hat{k}$

(5 marks)

S8 (a) Find the circle equations that meet the following criteria:

Cari persamaan bulatan yang memenuhi syarat berikut:

(i) Center point = (6, -2), radius = 13 unit.
Berpusat di (6, -2), jejari = 13 unit.

(ii) Center point at the origin and passes through (3,8)
berpusat di asalan, melalui (3,8).

(6 marks)

(b) Find the center and radius of the following circle: $x^2 + y^2 - 6x - 12y - 55 = 0$.
Then, sketch the circle.

*Cari pusat dan jejari bagi bulatan berikut: $x^2 + y^2 - 6x - 12y - 55 = 0$.
Kemudiannya lakarkan bulatan tersebut.*

(6 marks)

- (c) Identify the vertex and focus for the following parabolas, then sketch the parabola.
Cari verteks dan fokus bagi parabola berikut dan kemudiannya lakarkan parabola tersebut.

(i) $y - 4 = 2(x - 3)^2$
(ii) $x = -y^2/2 + 2y + 4$

(8 marks)

-END OF QUESTION-

-SOALAN TAMAT-

Senarai Formula

$$\begin{aligned}\cos(a + b) &= \cos(a)\cos(b) - \sin(a)\sin(b) \\ \cos(a - b) &= \cos(a)\cos(b) + \sin(a)\sin(b)\end{aligned}$$

$$\begin{aligned}\sin(a + b) &= \sin(a)\cos(b) + \cos(a)\sin(b) \\ \sin(a - b) &= \sin(a)\cos(b) - \cos(a)\sin(b)\end{aligned}$$

and

$$\tan(a + b) = \frac{\tan(a) + \tan(b)}{1 - \tan(a)\tan(b)}$$

$$\tan(a - b) = \frac{\tan(a) - \tan(b)}{1 + \tan(a)\tan(b)}$$

Of course, we used the fact that

$$\cos(-a) = \cos(a) \text{ and } \sin(-a) = -\sin(a)$$

$$\cos(2a) = \cos^2(a) - \sin^2(a) = 2\cos^2(a) - 1 = 1 - 2\sin^2(a)$$

$$\sin(2a) = 2\sin(a)\cos(a)$$

$$\tan(2a) = \frac{2\tan(a)}{1 - \tan^2(a)}$$

From the Double-Angle formulas, one may generate easily the Half-Angle formulas

$$\cos(a) = \cos^2\left(\frac{a}{2}\right) - \sin^2\left(\frac{a}{2}\right) = 2\cos^2\left(\frac{a}{2}\right) - 1 = 1 - 2\sin^2\left(\frac{a}{2}\right)$$

$$\sin(a) = 2\sin\left(\frac{a}{2}\right)\cos\left(\frac{a}{2}\right)$$

$$\tan(a) = \frac{2\tan\left(\frac{a}{2}\right)}{1 - \tan^2\left(\frac{a}{2}\right)}$$

In particular, we have

$$\cos^2\left(\frac{a}{2}\right) = \frac{1}{2}(1 + \cos(a))$$

$$\sin^2\left(\frac{a}{2}\right) = \frac{1}{2}(1 - \cos(a))$$

Surd dan logaritma:

- $(x^m)(x^n) = x^{(m+n)}$
- $m^n \div m^n = m^{(n-n)}$
- $\log_a(b^M) = M \log_a(b)$
- $\log_a(MN) = \log_a(M) + \log_a(N)$
- $\log_a(M/N) = \log_a(M) - \log_a(N)$

matrik:

- $IA = AI = A$
- $AA^{-1} = A^{-1}A = I$

Conic section:

bulatan

$$x^2 + y^2 = r^2$$

$$(x-h)^2 + (y-k)^2 = r^2$$

Parabola

$$x^2 = 4py$$

$$\text{Vertical: } (x-h)^2 = 4p(y-k)$$

$$\text{Horizontal: } (y-k)^2 = 4p(x-h)$$

Elips

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

$$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$$

Hyperbola

$$\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$$

$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$$