



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2014/2015**

COURSE NAME : MATHEMATICS 1
COURSE CODE : BBM 10303
PROGRAM : 1BBE/1BBU/1BBD/1BBB/1BBF
DATE : JUNE 2015/JULY 2015
DURATION : 3 HOURS
INSTRUCTION : ANSWER FIVE QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF FOURTEEN (14) PRINTED PAGES

- S1 (a) Sebuah segiempat ABCD mempunyai titik A pada (4,3), B pada (-2,3) dan C pada (-2,-5).
- (i) Cari koordinat titik D. (2 markah)
 - (ii) Dapatkan persamaan garis lurus yang melalui titik B dan D. (3 markah)
 - (iii) Dapatkan persamaan garis lurus yang berserenjang dengan garis BD dan melalui titik A. (5 markah)
 - (iv) Tentukan panjang AC. (2 markah)
- (b) Terdapat dua titik A $(1, \frac{7}{2})$ dan B $(\frac{9}{2}, 1)$ terletak pada lilitan bulatan yang berpusat pada (2,1).
- (i) Kira panjang jejari bulatan tersebut. (2 markah)
 - (ii) Tentukan kecerunan bagi garis yang menyambung pusat bulatan dengan titik B. (3 markah)
 - (iii) Titik (3,-1) adalah titik tengah BC. Tentukan koordinat titik C. (3 markah)

SULIT

S2 (a) Cari punca-punca persamaan kuadratik berikut menggunakan:

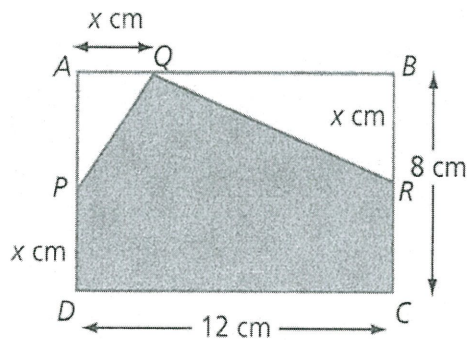
(i) kaedah Pemfaktoran : $x^2 - 3x - 10 = 0$

(2 markah)

(ii) Kaedah Penyempurnaan Kuasa Dua: $2x^2 - 5x = 6$

(10 markah)

(b) Rajah Q2 menunjukkan sebuah segiempat ABCD dengan panjang 12cm dan lebar 8cm. Titik P, Q dan R terletak pada sisi AD, AB dan BC masing-masing di mana $PD = AQ = BR = x$ cm. Sekiranya luas kawasan berlorek adalah 76cm^2 , tunjukkan bahawa $x^2 - 10x + 20 = 0$.



Rajah Q2(b)

(8 markah)

S3 (a) Ungkapkan $\frac{x^2+15}{(x+3)^2(x^2+3)}$ dalam pecahan separa.

(10 markah)

(b) Cari penyelesaian kepada $2 + \frac{x-3}{4} \geq \frac{2x+1}{5}$

(4 markah)

(c) Cari julat nilai x yang memenuhi $5x(x+3) > 2(2x-1)$.

(6 markah)

SULIT

- S4 (a) Diberi $\sin A = 4/5$, $\sin B = 5/13$ dan A merupakan sudut tirus dan B adalah sudut cakah. Cari nilai-nilai yang berikut tanpa menggunakan kalkulator:

- (i) $\sin (A+B)$
(ii) $\tan (A+B)$

(6 markah)

- (b) Jika $\sin \theta = -\frac{2}{5}$ dan $180 < \theta < 270$, nilaikan $\cos 2\theta$.

(6 markah)

- (c) Buktikan bahawa :

$$\frac{\cos \theta}{1 + \sin \theta} + \frac{1 + \sin \theta}{\cos \theta} = 2 \sec \theta$$

(8 markah)

- S5 (a) Selesaikan sistem persamaan linear berikut dengan menggunakan petua Cramer:

$$\begin{aligned} 2x - y + 6z &= 10 \\ -3x + 4y - 5z &= 11 \\ 8x - 7y - 9z &= 12 \end{aligned}$$

(10 markah)

- (b) Ali melabur RM25,000 dalam amanah saham, bon kerajaan, dan simpanan tetap. Jumlah wang yang dilabur dalam simpanan tetap adalah RM5000 lebih daripada jumlah yang dilabur dalam amanah saham. Selepas setahun, Ali menerima sebanyak RM1000 daripada ketiga-tiga pelaburan tersebut. Sebanyak 4.0% dibayar daripada amanah saham, 4.5% daripada bon kerajaan, dan 3.5% daripada simpanan tetap.

- (i) Dengan menggunakan x, y dan z mewakili wang dilabur dalam amanah saham, bon kerajaan, dan simpanan tetap masing-masing, bentukkan sistem persamaan linear berdasarkan maklumat di atas.

- (ii) Cari jumlah wang yang dilabur dalam setiap kategori pelaburan dengan menggunakan kaedah penghabusan Gauss.

(10 markah)

SULIT

- S6** (a) Diberi $z_1 = 2 + 3i$, dan $z_2 = 4 - 5i$, cari
- (i) $z_1 z_2$ (2 markah)
- (ii) $\frac{z_1}{z_2}$ (4 markah)
- (iii) $z_1 z_2$ dalam bentuk kutub. (4 markah)
- (iv) (z_1/z_2) dalam bentuk kutub. (4 markah)
- (b) Biar $z = 1 - i$, cari z^{10} menggunakan De Moivre's Theorem. (6 markah)
- S7** (a) Jika $u = 3i - j$ dan $v = 2i + 5j$, cari
- (i) $|u|$ dan $|v|$ (4 markah)
- (ii) vektor UV (2 markah)
- (iii) $w = 2u - 4v$ (3 markah)
- (iv) vektor unit yang selari dengan w . (3 markah)
- (b) Dapatkan persamaan garis yang melalui titik A(1,2,3) dan B(4,4,4). (4 markah)
- (c) Cari magnitude dan arah bagi $3i + 4j$. (4 markah)

SULIT

SULIT

- S8 (a) Cari persamaan bulatan dan jejari bagi $(x-3)^2 + (y+4)^2 = 36$, kemudian lukiskan bulatan tersebut. (6 markah)
- (b) Cari pusat dan titik tumpuan bagi elips berikut: $4x^2 + 9y^2 - 24x + 36y + 36 = 0$ (6 markah)
- (c) Cari persamaan parabola yang mana paksinya selari dengan paksi-y, bucu pada (2,-1) dan melalui titik (3,1). (8 markah)

SOALAN TAMAT**SULIT**

SULIT

- S1** (a) A rectangle ABCD has A at the point (4,3), B at (-2,3), and C at (-2, -5).
- (i) Find the coordinate of D. (2 marks)
- (ii) Find the line equation which passes through B and D. (2 marks)
- (iii) Find the line equation which is perpendicular to the line BD and passes through the point of A. (5 marks)
- (iv) Find the length of AC. (2 marks)
- (b) There are two points A $(1, \frac{7}{2})$ and B $(\frac{9}{2}, 1)$ located on the circumference of a circle that centered at (2,1).
- (i) Find the length of radius of that circle. (2 marks)
- (ii) Determine the gradient of the line that connects the center of the circle and point B. (3 marks)
- (iii) Point (3,-1) is the mid-point of BC. Find the coordinate of point C. (3 marks)
- S2** (a) Find the factors for the following quadratic equations:
- (i) Factorizing: $x^2 - 3x - 10 = 0$ (2 marks)
- (ii) Completing the Square: $2x^2 - 5x = 6$ (10 marks)

SULIT

- (b) Figure Q2(b) shows a rectangle ABCD of length 12cm and of breadth 8cm. The points P, Q and R lie on the sides AD, AB and BC respectively such that $PD = AQ = BR = x$ cm. If the area of the shaded region is 76cm^2 , show that $x^2 - 10x + 20 = 0$.

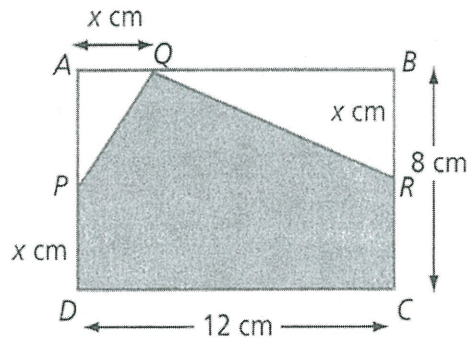


Figure Q2(b)

(8 marks)

- S3 (a) Express $\frac{x^2+15}{(x+3)^2(x^2+3)}$ in partial fraction.

(10 marks)

- (b) Find the solution of $2 + \frac{x-3}{4} \geq \frac{2x+1}{5}$

(4 marks)

- (c) Find the range values of x which satisfy $5x(x+3) > 2(2x-1)$.

(6 marks)

- S4 (a) Given $\sin A = 4/5$, $\sin B = 5/13$ and A is acute angle and B is obtuse angle. Without using calculator, find the values for the following:

(iii) $\sin(A+B)$

(iv) $\tan(A+B)$

(6 marks)

- (b) If $\sin \theta = -\frac{2}{5}$ and $180 < \theta < 270$, find the value of $\cos 2\theta$. (6 marks)

- (c) Prove that :

$$\frac{\cos \theta}{1 + \sin \theta} + \frac{1 + \sin \theta}{\cos \theta} = 2 \sec \theta$$

(8 marks)

- S5 (a) Solve the following system of linear equation using the Cramer's rule:

$$\begin{aligned} 2x - y + 6z &= 10 \\ -3x + 4y - 5z &= 11 \\ 8x - 7y - 9z &= 12 \end{aligned}$$

(10 marks)

- (b) Ali invests RM25,000 in a trust fund, government bond, and fixed deposit. The amount he put in fixed deposit is RM5000 more than that in trust fund. After a year, he received profit totaling RM1000 from the three investments. The trust fund paid 4.0% annually, the government bond paid 4.5% annually, and the fixed deposit paid 3.5% annually.

- (i) By denoting x , y , and z as the amount of money invested in trust fund, government bond, and fixed deposit respectively, form a system of linear equation based on the above information.
- (ii) Find the amount of money invested in each category of fund using Gaussian Elimination Method.

(10 marks)

- S6 (a) Given $z_1 = 2 + 3i$, and $z_2 = 4 - 5i$, find
- (i) $z_1 z_2$ (2 marks)
 - (ii) $\frac{z_1}{z_2}$ (4 marks)
 - (iii) $z_1 z_2$ in polar form. (4 marks)
 - (iv) (z_1/z_2) in polar form. (4 marks)
- (b) Let $z = 1 - i$, find z^{10} using De Moivre's Theorem. (6 marks)
- S7 (a) If $u = 3i - j$ and $v = 2i + 5j$, find
- (i) $|u|$ and $|v|$ (4 marks)
 - (ii) vector UV (2 marks)
 - (iii) $w = 2u - 4v$ (3 marks)
 - (iv) unit vector parallel to w . (3 marks)
- (b) Find the equation of the line through points A(1,2,3) and B(4,4,4). (4 marks)
- (c) Find the magnitude and direction of $3i + 4j$. (4 marks)

SULIT

- S8 (a) Find the circle and radius of the circle for $(x-3)^2 + (y+4)^2 = 36$, then graph the circle. (6 marks)
- (b) Find the center, focal point of the following ellipses: $4x^2 + 9y^2 - 24x + 36y + 36 = 0$ (6 marks)
- (c) Find the equation of a parabola with the axis is parallel to the axis-y, vertex on (2,-1) through point (3,1). (8 marks)

END OF QUESTIONS**SULIT**

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

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

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

SULIT

matrices:

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

Conic section:

Circle:

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

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

Parabola:

$$x^2 = 4py$$

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

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

Ellipse:

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

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

Hyperbola:

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

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

Cartesian coordinate:

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

$$\text{Gradient} = \frac{(y_2 - y_1)}{(x_2 - x_1)}$$

$$y - y_1 = m(x - x_1)$$

SULIT

SULIT

Division of line segment:

$$x - x_1 = k(x_2 - x_1)$$

$$x = x_1 + k(x_2 - x_1)$$

By similar reasoning,

$$y = y_1 + k(y_2 - y_1)$$

Vector:

$$P \bullet Q = |P| |Q| \cos \theta$$

$$|a \times b| = |a| |b| \sin \theta$$

$$\text{Area of PQR} = \frac{1}{2} |PQ \times PR|$$

$$\text{Area of PQRS} = |u| |v| \sin \theta$$

$$\text{Unit Vector} = \frac{bi+cj+dk}{\sqrt{b^2+c^2+d^2}}$$

[Faint handwritten scribbles]

SULIT