SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI JUN 2019

DBM1013 : ENGINEERING MATHEMATICS 1

TARIKH : 08 NOVEMBER 2019
MASA : 3.00 PETANG – 5.00 PETANG (2 JAM)

Kertas ini mengandungi **SEPULUH (10)** halaman bercetak.
Bahagian A: Subjektif (2 soalan)
Bahagian B: Subjektif (4 soalan)
Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SECTION A: 50 MARKS

BAHAGIAN A: 50 MARKAH

INSTRUCTION:

This section consists of **TWO (2)** subjective questions. Answer **ALL** questions.

ARAHAN:

*Bahagian ini mengandungi **DUA (2)** soalan subjektif. Jawab **SEMUA** soalan.*

QUESTION 1

SOALAN 1

CLO1
C2

a) Express each of the following expressions in the simplest form:

Ungkapkan setiap yang berikut dalam bentuk termudah:

(i) $5(2p + 3) + 8p$

[2 marks]

[*2 markah*]

(ii) $\frac{2a + 1}{5m} - \frac{3a + 4}{15m}$

[4 marks]

[*4 markah*]

(iii) $\frac{x^2 - 4}{3y^2 + y} \times \frac{3y^2 - 2y - 1}{x^2 + x - 6}$

[4 marks]

[*4 markah*]

CLO1
C3

b) Solve the following quadratic equations by using the given method.
Selesaikan persamaan kuadratik berikut dengan menggunakan kaedah yang dinyatakan:

(i) Solve by factorization :
Selesaikan melalui pemfaktoran:

$$x^2 - 9x + 14 = 0$$

[4 marks]
[*4 markah*]

(ii) Solve by quadratic formula :
Selesaikan dengan menggunakan formula kuadratik:

$$9p^2 - 9p = -2$$

[5 marks]
[*5 markah*]

(iii) Solve by completing the square :
Selesaikan dengan kaedah penyempurnaan kuasa dua:

$$x^2 + 5x + 6 = 0$$

[6 marks]
[*6 markah*]

QUESTION 2

SOALAN 2

CLO1 C2

a) Determine value A and B in partial fraction below.

Tentukan nilai A dan B dalam bentuk pecahan separa di bawah

$$\frac{5-x}{x^2+x-6}=\frac{A}{(x-2)}+\frac{B}{(x+3)}$$

[4 marks]

[*4 markah*]

CLO1 C3

b) Solve the following partial fractions.

Selesaikan pecahan separa berikut.

i. $\dfrac{2x}{x(x+3)(x-5)}$

[6 marks]

[*6 markah*]

ii. $\dfrac{5x^2+23x+24}{(2x+3)(x+2)^2}$

[8 marks]

[*8 markah*]

iii. $\dfrac{2x^3+3x^2+1}{x(2x+1)}$

[7 marks]

[*7 markah*]

SECTION B: 50 MARKS

BAHAGIAN B: 50 MARKAH

INSTRUCTION:

This section consistof **FOUR (4)** subjective questions. Answer **TWO (2)** questions only.

ARAHAN:

*Bahagian ini mengandugi **EMPAT (4)** soalan subjektif. Jawab **Dua (2)** soalan sahaja.*

QUESTION 3

SOALAN 3

CLO2
C2

a) Express the following expression in the simplest form.

Permudahkan ungkapan yang berikut.

$$\overrightarrow{PQ}+\overrightarrow{QR}+\overrightarrow{RP}$$

[3 marks]

[*3 markah*]

CLO2
C2

b) The position vector of point A and B are

Posisi vector bagi titik A dan B ialah:

$$\tilde{a}=3\tilde{i}-4\tilde{j} \text{ and } \tilde{b}=2\tilde{i}+5\tilde{j}$$

i. Determine vector $\overrightarrow{AB}$

Tentukan vektor $\overrightarrow{AB}$

[3 marks]

[*3 markah*]

ii. Determine vector $\left|2\tilde{a}-4\tilde{b}\right|$

Tentukan vektor $\left|2\tilde{a}-4\tilde{b}\right|$

[4 marks]

[*4 markah*]

CLO2
C3

c) Given that, $\vec{A} = -3\tilde{i} + 3\tilde{j} + 2\tilde{k}$, $\vec{B} = -2\tilde{i} - 4\tilde{j} + 2\tilde{k}$ and $\vec{C} = 4\tilde{i} + 3\tilde{j} + \tilde{k}$. Calculate

Diberi, $\vec{A} = -3\tilde{i} + 3\tilde{j} + 2\tilde{k}$, $\vec{B} = -2\tilde{i} - 4\tilde{j} + 2\tilde{k}$ and $\vec{C} = 4\tilde{i} + 3\tilde{j} + \tilde{k}$. Kira

i. $\vec{A} \bullet \vec{C}$

[3 marks]

[*3 markah*]

ii. $\vec{A} \bullet \left(\vec{B} \times \vec{C}\right)$

[6 marks]

[*6 markah*]

iii. $\left(\vec{A} \times \vec{B}\right) \times \vec{C}$

[6 marks]

[*6 markah*]

QUESTION 4

SOALAN 4

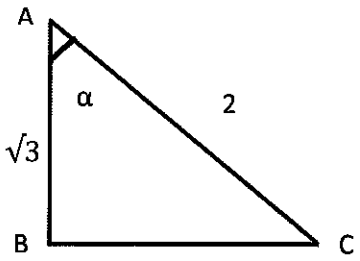


Diagram 4 (a)

Rajah 4 (a)

CLO2
C2

a) Referring to Diagram 4(a), given AB = $\sqrt{3}$ units and AC = 2 units. Determine:

Merujuk kepada rajah 4(a) diberi AB = $\sqrt{3}$ unit dan AC = 2 unit. Tentukan:

i. The value of the angle, α

Nilai sudut, α

[3 marks]

[*3 markah*]

ii. cot α

Kot α

[3 marks]

[*3 markah*]

iii. The perimeter of the triangle.

Perimeter segitiga itu.

[4 marks]

[*4 markah*]

CLO2
C3

b) Solve the following equation for $0^0 \leq \theta \leq 360^0$:

Selesaikan persamaan trigonometri berikut untuk $0^0 \leq \theta \leq 360^0$:

i. $\cot^2 \theta = 1$

$Kot^2\ \theta = 1$

[4 marks]

[*4 markah*]

ii. $\text{Cos}^2\ \theta = 2\cos\theta - 1$

$Kos^2\ \theta = 2\,kos\,\theta - 1$

[5 marks]

[*5 markah*]

iii. $6 - 8\sin\theta\ = cosec\ \theta$

$6 - 8\,sin\,\theta\ = kosec\ \theta$

[6 marks]

[*6 markah*]

QUESTION 5

SOALAN 5

CLO2 C2

a) Given that $P = 2 + 3i$ and $= -4 + i$. Compute the following in Cartesian form.
Diberi $P = 2 + 3i$ *dan* $Q = -4 + i$ *. Kira nombor kompleks berikut dalam bentuk Cartesian.*

i. $P - Q$

[2 marks]
[*2 markah*]

ii. $2PQ$

[3 marks]
[*3 markah*]

iii. PQ^2

[5 marks]
[*5 markah*]

CLO2 C3

b) If $Z_1 = 2 + i$ and $Z_2 = 1 + 3i$, express the following in the form of a+bi.
Jika $Z_1 = 2 + i$ *dan* $Z_2 = 1 + 3i$*, ungkapkan yang berikut dalam sebutan a+bi.*

i. $Z_1 - Z_2$

[2 marks]
[*2 markah*]

ii. ${Z_2}^2 + Z_1$

[3 marks]
[*3 markah*]

iii. $\frac{1}{Z_1} + \frac{1}{Z_2}$

[5 marks]
[*5 markah*]

iv. $\frac{Z_2 - Z_1}{2Z_1}$

[5 marks]
[*5 markah*]

QUESTION 6

SOALAN 6

CLO2 C2

a) Given that $A = \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 \\ -1 & 4 \end{bmatrix}$, find :

Diberi $A = \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$ *dan* $B = \begin{bmatrix} 1 & 2 \\ -1 & 4 \end{bmatrix}$, *cari :*

i. 2A + 3B

[3 marks]

[*3 markah*]

ii. A x B

[3 marks]

[*3 markah*]

CLO2 C2

b) Find the determinant of matrix A.

Cari penentu bagi matrik A

$$A = \begin{bmatrix} 1 & 2 & 1 \\ 3 & 2 & 5 \\ 2 & 1 & 3 \end{bmatrix}$$

[4 marks]

[*4 markah*]

CLO2 C3

c) Solve the simultaneous linear equation below by using Cramer's rule.

Selesaikan persamaan serentak linear di bawah menggunakan petua Cramer.

$$x + 2z = 9$$
$$2y + z = 8$$
$$4x - 3y = -2$$

[15 marks]

[*15 markah*]

SOALAN TAMAT

FORMULA SHEET FOR ENGINEERING MATHEMATICS (DBM1013)

QUADRATIC EQUATION

1. ***Quadratic formula,*** $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$
2. ***Completing the square,***

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

FORMULA OF TRIANGLE

1. ***Sine Rules;*** $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
2. ***Cosine Rules;*** $\mathbf{a^2 = b^2 + c^2 - 2bc \cos A}$
3. ***Area of Triangle*** $= \frac{1}{2}ab \sin C$

MATRIX

1. ***Cofactor;*** $C = (-1)^{i+j} M_{ij}$
2. ***Adjoin;*** $Adj(A) = C^T$
3. ***Inverse of Matrix;*** $A^{-1} = \frac{1}{|A|} Adj(A)$
4. ***Cramer's Rule;***

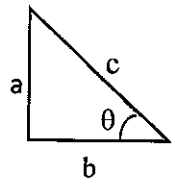
$$x = \frac{|A_1|}{|A|}, y = \frac{|A_2|}{|A|}, z = \frac{|A_3|}{|A|}$$

COMPLEX NUMBER

1. ***Modulus of*** $z = \sqrt{a^2 + b^2}$
2. ***Argument of*** $z = tan^{-1}\left(\frac{b}{a}\right)$
3. ***Cartesian Form;*** $z = a + bi$
4. ***Polar Form;*** $z = r\angle\theta$
5. ***Exponential Form;*** $z = re^{i\theta}$
6. ***Trigonometric Form;*** $z = r(\cos\theta + \mathrm{i}\sin\theta)$

TRIGONOMETRY

Pythagoras' Theorem



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

Trigonometric Identities

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

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

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

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

VECTOR & SCALAR

1. ***Unit Vector;*** $\hat{u} = \frac{\bar{u}}{|u|}$
2. ***Cos θ*** $= \frac{\bar{A} \bullet \bar{B}}{|A||B|}$
3. ***Scalar Product;***

$$\vec{A} \bullet \vec{B} = a_1a_2 + b_1b_2 + c_1c_2$$

4. ***Vector Product;***

$$\vec{A} \times \vec{B} = \begin{vmatrix} i & j & k \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix}$$

5. ***Area of parallelogram ABC;***

$$\left|\overrightarrow{AB} \times \overrightarrow{BC}\right|$$

COMPOUND-ANGLE

1. $sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$
2. $cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$
3. $tan(A \pm B) = \frac{tan\ A \pm tan\ B}{1 \mp \tan A \tan B}$

DOUBLE-ANGLE

1. $\sin 2A = 2 \sin A \cos A$
2. $\cos 2A = cos^2A - sin^2A$

$$= 1 - 2sin^2A$$

$$= 2cos^2A - 1$$

3. $\tan 2A = \frac{2 \tan A}{1 - tan^2A}$