Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(ONLINE)
SEMESTER II
SESSION 2020/2021

COURSE NAME	:	MATHEMATICS 1
COURSE CODE	:	BBP 10603
PROGRAMME CODE	:	BBA / BBB / BBD / BBE / BBF / BBG
EXAMINATION DATE	:	JULY 2021
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

Q1 (a) Given that $A=(-\infty,-5), B=[-1,4)$ and $C=(3,\infty)$. Graph the indicated sets and write as a single interval, if possible for:

i) $A \cap B$

ii) $B \cup C$

(3 marks)

(b) Simplify $\dfrac{x^2 \times \sqrt{x^5}}{x^{-\frac{1}{2}}}$.

(2 marks)

(c) Find the value of x for the equation $25^{2x+1} = 125^{3x+2}$.

(3 marks)

(d) Given that $2^{3y} = 150$. Find the value of y and write your answer up to four (4) decimal points.

(3 marks)

(e) i) Express $\log_x 256$ as a logarithm to base 2.

ii) Hence, use your answer in i), and the substitution $u = \log_2 x$, solve the equation $\log_2 x + 8\log_x 256 = 6$.

(6 marks)

(f) Given that a complex number $a = -3 + 2i$. Find $a\bar{a}$ and state your answer in Polar Form.

(3 marks)

Q2 (a) Find the values of w for the quadratic equation $w^2 + 10 = 7w$.

(2 marks)

(b) Sketch the graph of quadratic equation $4m^2 + 8m - 45 = 0$.

(5 marks)

(c) Solve the inequality $3x + 5 > -4x + 2$. What is the minimum value of x if x is an integer number?

(3 marks)

(d) Two rectangulars are drawn as depicted in **Diagram Q2(d)** below. Given that the smaller rectangular, $ABCD$ has dimension lenght, $AB = 6cm$ and width, $BD = 4cm$. While the lenght and the width of bigger rectangular, $PQRS$ are unknown.

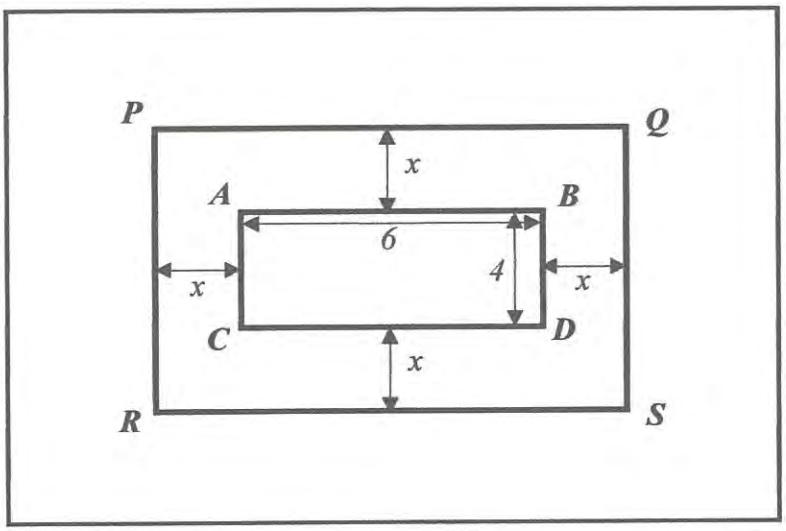

Diagram Q2(d)

Find the value of x if the total area of the bigger rectangular is $224cm^2$.

(4 marks)

(e) Decompose $\frac{x^2+3x+1}{x^2-4}$ into partial fraction.

(6 marks)

Q3 (a) Given that $\tan A = \frac{4}{3}$ and $\cos B = -\frac{1}{\sqrt{3}}$, where A and B are in the same quadrant. Find the value of:

i) $\sin A$

ii) $\cos A$

iii) $\tan B$

(6 marks)

(b) In **Diagram Q3(b)** below, $\cot \angle CBE = \frac{8}{6}$ and $\cot \angle ACD = \frac{12}{5}$. Find the value of m.

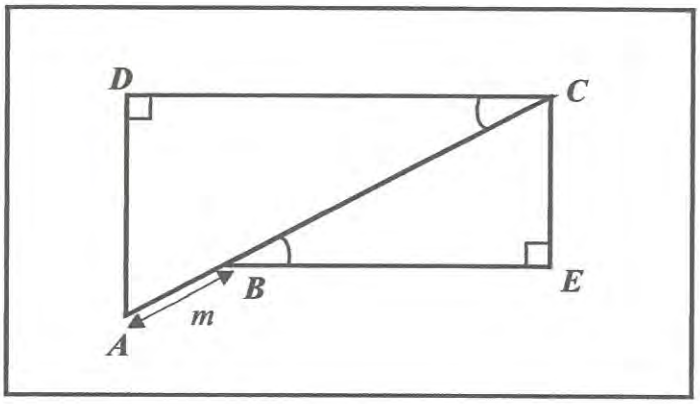

Diagram Q3(b)

(3 marks)

(c) Solve the equation $5\cot x = \tan x + 4$ for $0° \le x \le 180°$.

(3 marks)

(d) Prove that $\frac{1}{\cos x} - \cos x = \sin x \tan x$.

(4 marks)

(e) At a point 150 feet from the base of a school, the angle of elevation to the bottom of a clock tower on the roof of the school is 42°, and the angle of elevation to the top of the clock tower is 53°.

i) Sketch the above situation.

ii) Find the height of the clock tower.

(4 marks)

Q4 (a) Given that matrices $A = \begin{bmatrix} 3 & 2 & 0 \\ -1 & 4 & -6 \end{bmatrix}$, $B = \begin{bmatrix} 5 & -2 \\ 1 & 3 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & 2 & -4 \\ 0 & -2 & 3 \\ 5 & 0 & 4 \end{bmatrix}$.

Calculate:

i) BA

ii) AC

(4 marks)

(b) Find the values of x and y, so that

$$\begin{bmatrix} x & 5 \\ 8 & x \end{bmatrix} + \begin{bmatrix} 2y & 2 \\ 1 & -y \end{bmatrix} = \begin{bmatrix} 4 & 7 \\ 9 & 7 \end{bmatrix}$$

(3 marks)

(c) Show that matrices $A = \begin{bmatrix} 4 & 3 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -3 \\ -1 & 4 \end{bmatrix}$ are inverse to each other.

(4 marks)

(d) Write the system of linear equation

$$\begin{aligned} 3x + 2y &= 3 \\ -2x - y &= -1 \end{aligned}$$

as a matrix equation. Then find the values of x and y by using inverse.

(3 marks)

(e) Solve the following system linear of equations:

$$\begin{aligned} x - 3y + 3z &= -4 \\ 2x + 3y - z &= 15 \\ 4x - 3y - z &= 19 \end{aligned}$$

(6 marks)

Q5 (a) If vectors $\boldsymbol{u} = \begin{pmatrix} 3 \\ -6 \\ 9 \end{pmatrix}$, $\boldsymbol{v} = \begin{pmatrix} -2 \\ 0 \\ 1 \end{pmatrix}$ and $\boldsymbol{w} = \begin{pmatrix} -3 \\ -5 \\ 4 \end{pmatrix}$, find:

i) $\frac{1}{3}\boldsymbol{u} + 2\boldsymbol{w}$

ii) $\boldsymbol{u} - 3\boldsymbol{v} + 4\boldsymbol{w}$

(4 marks)

(b) Given that vectors $\boldsymbol{a} =< 1,1,3 >$, $\boldsymbol{b} =< 0,-1,-2 >$ and $\boldsymbol{c} =< -3,2,-5 >$, find:

i) $\boldsymbol{a} \times \boldsymbol{b}$

ii) $(2\boldsymbol{a} + \boldsymbol{b}) \bullet \boldsymbol{c}$

iii) the angle between $\boldsymbol{b} \bullet \boldsymbol{c}$

(6 marks)

(c) Given that vectors $\boldsymbol{r} = -\boldsymbol{i} + 2\boldsymbol{j} - 3\boldsymbol{k}$, $\boldsymbol{s} = 4\boldsymbol{i} - 5\boldsymbol{k}$ and $\boldsymbol{t} = -2\boldsymbol{j} + \boldsymbol{k}$, calculate:

i) $|2\boldsymbol{r} + \boldsymbol{s} - 3\boldsymbol{t}|$

ii) $|3\boldsymbol{r}| + |-\boldsymbol{s}| + 2|\boldsymbol{t}|$

(4 marks)

(d) If vectors $\boldsymbol{a} = \begin{pmatrix} 1 \\ -1 \\ 0 \end{pmatrix}$, $\boldsymbol{b} = \begin{pmatrix} 2 \\ 3 \\ -5 \end{pmatrix}$ and $\boldsymbol{c} = \begin{pmatrix} -1 \\ -4 \\ -3 \end{pmatrix}$, find:

i) $(\boldsymbol{b} \times \boldsymbol{c}) \times -\boldsymbol{a}$

ii) $(2\boldsymbol{b} \times \boldsymbol{a}) + \boldsymbol{c}$

(6 marks)

-END OF QUESTIONS-

FINAL EXAMINATION FORMULA

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Quadratic equation:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Trigonometry:

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

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

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

$\sin 2\alpha = 2\sin\alpha\cos\alpha$

$\cos 2\alpha = \cos^2\alpha - \sin^2\alpha$

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

$\sin(\alpha \pm \beta) = \sin\alpha\cos\beta \pm \cos\alpha\sin\beta$

$\cos(\alpha \pm \beta) = \cos\alpha\cos\beta \mp \sin\alpha\sin\beta$

$\tan(\alpha \pm \beta) = \dfrac{\tan\alpha \pm \tan\beta}{1 \mp \tan\alpha\tan\beta}$

$\tan 2\alpha = \dfrac{2\tan\alpha}{1 - \tan^2\alpha}$ $AA^{-1} = A^{-1}A = I$

Solution of Systems of linear:

$A_{ij} = (-1)^{i+j} M_{ij}$

$$A^{-1} = \frac{1}{D}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

$$x_1 = \frac{|D_{x1}|}{|D|}, x_2 = \frac{|D_{x2}|}{|D|}, x_3 = \frac{|D_{x3}|}{|D|}$$

Complex Numbers:

$i^2 = -1$

$z = re^{i(\theta + 2k\pi)}$

$e^{i\theta} = \cos\theta + i\sin\theta$

Vectors:

$|v| = \sqrt{v_1^2 + v_2^2 + v_3^2}$

$\cos\theta = \dfrac{a \cdot b}{|a||b|}$