UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2018/2019

COURSE NAME   :   MATHEMATICS 1

COURSE CODE   :   BBM 10303 / BBP 10603

PROGRAMME CODE   :   BBA / BBB / BBE / BBF / BBG

EXAMINATION DATE   :   DECEMBER 2018 / JANUARY 2019

DURATION   :   3 HOURS

INSTRUCTION   :   ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

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Q1 (a) Given points $P(-4,8)$ and $Q(2,y)$ lie on a cartesian plane.

(i) If the mipoint of line PQ is $(-1,2)$, what is the coordinate of point Q?

[3 marks]

(ii) Find the distance from point P to point Q.

[2 marks]

(iii) Find the linear equation that passes through points P and Q.

[4 marks]

(b) A line AB passes through points $A(-4,2)$ and $B(-2,10)$. Line CD is perpendicular to the line AB. Find the equation of the line CD that passes through point $E(8,0)$.

[5 marks]

(c) Taufiq just plants a rambutan's tree. On the first day, the height of the rambutan's tree is $6cm$. The rambutan's tree grows $1.2cm$ per day.

(i) If x = number of the day and y = the height of the rambutan's tree, write a linear equation that represents the above situation.

[4 marks]

(ii) Based on the linear equation in **Q1**(c)(i), what is the height of the rambutan's tree on day 11th?

[2 marks]

Q2 (a) Solve the following quadratic equations by using factorization method:

(i) $3(x^2 + 2x) - 5 = x(x+5) + 10x$

[4 marks]

(ii) $2 - \dfrac{1}{x} = \dfrac{3}{x+2}$

[4 marks]

(b) Solve the following quadratic equation by using quadratic formula method:

(i) $x(x-2) = 5(x-1)$

[4 marks]

(ii) $1 + \dfrac{8}{x^2} = \dfrac{4}{x}$

[4 marks]

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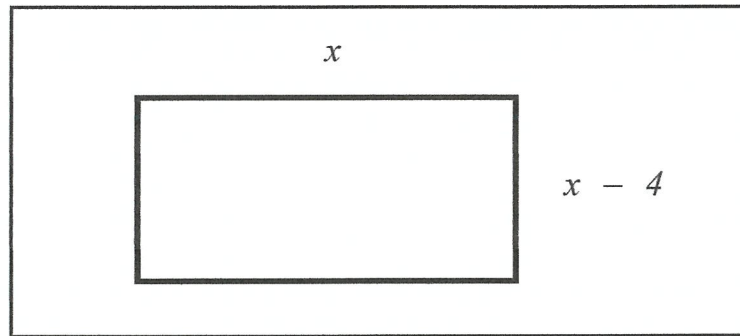**DIAGRAM Q2(c)**

(c)　Hana wants to install new wallpaper on the wall. The dimension of the wall is depicted in **DIAGRAM Q2**(c) where the length is x and the width is $(x-4)$. Hana bought seven (7) rolls of wallpapers and each roll of wallpaper can cover the area of $3m^2$. By assuming all the rolls of the wallpaper are used to cover the whole wall without any remainder, calculate the value of x.

[4 marks]

Q3　(a)　Solve each of the following inequalities:

(i)　　$3(x-1) \geq 5(x+2)-5$

(ii)　　$|5-2x| < 9$

[4 marks]

(b)　Decompose $\dfrac{5x^2+20x+6}{x(x+1)^2}$ into partial fraction.

[6 marks]

(c)　Given that $\tan\theta = \dfrac{5}{12}$ and $\sin\alpha = \dfrac{3}{5}$. Without using calculator, find the value of:

(i)　　$\csc\theta$

(ii)　　$\sec\theta$

(iii)　　$\cot\alpha$

[6 marks]

(d)　Prove that $\tan\theta + \cot\theta = \sec\theta\csc\theta$

[4 marks]

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Q4   (a)   Find the inverse matrix of matrix $A = \begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix}$

[4 marks]

(b)   By using Cramer's rule, solve the following system of linear equation:

$$
\begin{array}{rcrcrcl}
5x_1 & - & 3x_2 & + & 2x_3 & = & 13 \\
2x_1 & - & x_2 & - & 3x_3 & = & 1 \\
4x_1 & - & 2x_2 & + & 4x_3 & = & 12
\end{array}
$$

[6 marks]

(c)   Simplify the following expression:

(i) $7i(4-3i)$

(ii) $(5+3i)^2$

[4 marks]

(d)   Solve $z = \dfrac{1+7i}{1+i}$. Hence, express your answer in Polar Form.

[6 marks]

Q5   (a)   Given the vectors $\mathbf{u} = 4\mathbf{i} - \mathbf{j} + \mathbf{k}$ and $\mathbf{v} = 2\mathbf{i} + 3\mathbf{j} - \mathbf{k}$. Find:

(i) $\mathbf{u} \cdot \mathbf{v}$

[2 marks]

(ii) $\mathbf{u} \times \mathbf{v}$

[2 marks]

(iii)   the angle between $\mathbf{u}$ and $\mathbf{v}$

[2 marks]

(b)   Given the vectors $\mathbf{r} = 2\mathbf{i} + \mathbf{j} + 4\mathbf{k}$ and $\mathbf{s} = 3\mathbf{i} - 2\mathbf{j} - \mathbf{k}$. Find:

(i) $|\mathbf{r}| + |\mathbf{s}|$

[2 marks]

(ii) $|-3\mathbf{r}| + 4|\mathbf{s}|$

[3 marks]

(iii) $\dfrac{\mathbf{r}}{|\mathbf{r}|} + \dfrac{\mathbf{s}}{|\mathbf{s}|}$

[3 marks]

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(c)   Given the vectors $\mathbf{a} = 2\mathbf{i} - \mathbf{j} + 3\mathbf{k}$, $\mathbf{b} = \mathbf{j} + 7\mathbf{k}$ and $\mathbf{c} = \mathbf{i} + 4\mathbf{j} + 5\mathbf{k}$. Find the value of:

(i) $\mathbf{a} \times (\mathbf{b} \times \mathbf{c})$

[3 marks]

(ii) $(\mathbf{a} \times \mathbf{b}) - 2\mathbf{c}$

[3 marks]

-END OF QUESTIONS-

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FINAL EXAMINATION FORMULA

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Linear equations:

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

$$(\bar{x}, \bar{y}) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$slope = \frac{y_2 - y_1}{x_2 - x_1}, x_2 \neq x_1$$

$$y = mx + c$$

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

Quadratic equation:

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

Trigonometry:

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

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

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

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

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

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

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

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

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

Solution of Systems of linear:

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

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

Complex Numbers:

$$i^2 = -1$$

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

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

Vectors:

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

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