Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2017/20178

COURSE NAME	:	MATHEMATICS I
COURSE CODE	:	BBM 10303
PROGRAMME CODE	:	BBA/BBD/BBF/BBG
EXAMINATION DATE	:	DECEMBER 2017 / JANUARY 2018
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

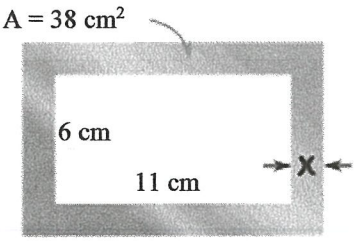

FIGURE Q2 (d)

(d) Your company is going to make frames as part of a new product they are launching. The frame will be cut out from a piece of steel, and to keep the weight down, the final area should be 38 cm^2. The inside of the frame has to be 11 cm by 6 cm as shown in **FIGURE Q2 (d)**. What should the width x of the metal be?

(6 marks)

Q3 (a) Solve each of the following inequalities

(i) $5x+1 \leq 3x-17$

(ii) $\left|\frac{1}{2}x+2\right| > 6$

(6 marks)

(b) Express $\frac{2x+16}{x^2+x-6}$ in partial fractions

(6 marks)

(c) An electric pole is 10 m high. A steel wire tied to the top of the pole is affixed at a point on the ground to keep the pole upright. If the wire makes an angle of 45 degree with the horizontal through the foot of the pole, find the length of the wire

(4 marks)

(d) Prove that $\frac{1}{\cos^2\theta} - \tan^2\theta = 1$

(4 marks)

Q4 (a) Find the inverse of the matrix $G = \begin{bmatrix} 3 & 3 & 2 \\ -2 & 1 & 5 \\ 4 & -3 & -12 \end{bmatrix}$ using

Elementary Row Operations

(4 marks)

(b) Use Gaussian elimination to solve the system of linear equations

$$2x_1 - 3x_2 + 4x_3 = 2$$
$$4x_1 + x_2 + 2x_3 = 2$$
$$x_1 - x_2 + 3x_3 = 3$$

(6 marks)

(c) Express $4.5 - 2.5i$ in the form re^{ix}

(4 marks)

(d) Given $Z_1 = 5 - 3i$ and $Z_2 = 7 + 2i$, find the following expressions in polar form, find $\frac{Z_1}{Z_2}$

(6 marks)

Q5 (a) If $\mathbf{u} = 3\mathbf{i} + 2\mathbf{j} - \mathbf{k}$ and $\mathbf{v} = \mathbf{i} + 5\mathbf{k}$, find

(i) $|\mathbf{u} + \mathbf{v}|$

(ii) $|\mathbf{u}| + |\mathbf{v}|$

(4 marks)

(b) Given $\mathbf{a} = <-1, 0, 3>$, $\mathbf{b} = <2, -6, 3>$ and $\mathbf{c} = <3, -3, 4>$, find the value of

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

(ii) $\hat{a}$

(6 marks)

(c) Find the center and radius of the $(x-2)^2 + (y+3)^2 = 9$ and sketch the equation

(5 marks)

(d) Sketch the equation of $\frac{x^2}{36} + \frac{y^2}{4} = 1$ and locate the foci

(5 marks)

-END OF QUESTIONS-

FINAL EXAMINATION
APPENDIX (FORMULA)

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:

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

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

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

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

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

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

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

$$\tan 2\alpha=\frac{2\tan\alpha}{1-\tan^2\alpha}$$

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

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

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:

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

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

Conic sections:

Circle:

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

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

Parabola:

$$x^2=4py$$

Vertical: $(x-h)^2=4p(y-k)$

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:

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

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