UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI(UCTATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: FGE 1113
COURSE	: MATHEMATICS I
SEMESTER/SESSION	: 2-2022/2023
DURATION	: 3 HOURS

Instructions:

1. This booklet contains **4** questions in SECTION A, **3** questions in SECTION B and **3** questions in SECTION C. Answer **ALL** questions.
2. All answers should be written in answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise your hands and ask the invigilator.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

THIS BOOKLET CONTAINS 6 PRINTED PAGES INCLUDING COVER PAGE

SECTION A (50 MARKS)

INSTRUCTION: ANSWER ALL QUESTIONS.

QUESTION 1

(a) Solve the following inequalities.

i. $|x+5|-6<-5$ (3 marks)

ii. $5x-7(x+1)>-9$ (4 marks)

(b) Simplify.

i. $27^{2x}=9^{x-3}$ (4 marks)

ii. $\dfrac{3a^4\times(10a)^3}{(5a^2)^3}$ (4 marks)

QUESTION 2

(a) Solve $11x^2=7-2x$ by using quadratic formula. (5 marks)

(b) Find the remainder when $x^4-2x^3-11x^2+34$ is divided by $x+2$ using long division method. (7 marks)

QUESTION 3

(a) Given that $A=\begin{bmatrix}2 & -3\\ 4 & 1\end{bmatrix}$, $B=\begin{bmatrix}-3 & 2\\ 7 & 6\end{bmatrix}$ and $C=\begin{bmatrix}4 & -3\\ -2 & -5\end{bmatrix}$. Find:

i. $2A+C$ (2 marks)

ii. AB (4 marks)

(b) Given that $\begin{bmatrix}3 & -2\\ -1 & 4\end{bmatrix}\begin{bmatrix}2x\\ 1\end{bmatrix}+2\begin{bmatrix}-4\\ 5\end{bmatrix}=4\begin{bmatrix}2\\ y\end{bmatrix}$. Find the values of x and y. (6 marks)

SECTION B (30 MARKS)

INSTRUCTION: ANSWER ALL QUESTIONS.

QUESTION 1

(a) Express $\frac{3x^2+17x+14}{(x-2)(x^2+2x+4)}$ as a partial fraction. (8 marks)

(b) Solve the following equations in the interval $0^\circ \le \theta \le 360^\circ$.

$$5\cos\theta + 7 = 3$$ (5 marks)

QUESTION 2

Given that $(2+10i)\,z = 7-i$.

(a) Express the complex number z in the form $a+bi$. (3 marks)

(b) Calculate the modulus and argument of z. (4 marks)

(c) Express the complex number z in polar form. (1 mark)

QUESTION 3

Given vectors $\vec{a} = i+3j$ and $\vec{b} = -2i+4j$. Find:

(a) Find the unit vector of $\vec{a}+\vec{b}$. (4 marks)

(b) Hence, calculate the angle between two vectors $\vec{a}$ and $\vec{b}$. (5 Marks)

QUESTION 4

(a) Given that $p = \log_a 4$ and $q = \log_a 5$, express each of the following logarithms in terms of p and q.

i. $\log_a 100$ (4 marks)

ii. $\log_a 0.4$ (4 marks)

(b) Simplify $\log_2 5 + \log_2 1.6$. Give the final answer as an integer. (3 marks)

SECTION C (20 MARKS)

INSTRUCTION: ANSWER ALL QUESTIONS.

QUESTION 1

(a) Find the *n*th term of the following series

$$1+3.5+6+8.5+\ldots+101$$ (3 marks)

(b) For what value of n does the sum $50+60+72+\ldots+50\times(1.2)^{n-1}$ first exceed 1000? (5 marks)

QUESTION 2

Figure 1 below shows a hot air balloon is flying above two point, standing on the ground at points A and B, 600m apart. The hot air balloon is 300m from A and 500m from B.

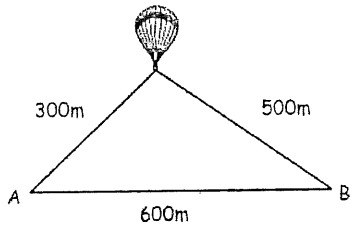

Figure 1

Find:

(a) $\angle B$ (4 marks)

(b) the height of the hot balloon from the ground (2 marks)

QUESTION 3

You decide to paint your kitchen green. You create the color of paint by mixing yellow and blue paints. You cannot remember how many liters of each color went into your mix, but you know there were 10 liters total. Additionally, you kept your receipt, and know the total amount spent was RM 295. If each liter of yellow costs RM 25.90, and each liter of blue costs RM 31.90, how many liters of each color go into your green mix? [Use Cramer's Rule]

(6 marks)

----------END OF QUESTIONS----------

FORMULA

i. If $\|x\| < a$, **then** $-a < x < a$ **ii.** If $\|x\| > a$, **then** $x > a$ **or** $x < -a$	$x^m . x^n = x^{m+n}$
$\frac{x^m}{x^n} = x^{m-n}$	$\left(x^n\right)^m = x^{mn}$
$(xy)^n = x^n y^n$	$\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$
$x^{m/n} = \sqrt[n]{x^m}$	$(x)^{-n} = \frac{1}{x^n}$
$\sqrt{a \times b} = \sqrt{a} \times \sqrt{b}$	$\sqrt{a} + \sqrt{a} = 2\sqrt{a}$
$\log_a xy = \log_a x + \log_a y$	$\log_a \frac{x}{y} = \log_a x - \log_a y$
$\log_a x^n = n \log_a x$	$z = a + bi, \quad \overline{z} = a - bi$
$\|z\| = \|a + b_i\| = \sqrt{a^2 + b^2}$ $z = \|z\|(\cos\theta + i\sin\theta)$	1^{st} **Quadrant:** $\theta = \tan^{-1}\left\|\frac{b}{a}\right\|$ 2^{nd} **Quadrant:** $\theta = \pi - \tan^{-1}\left\|\frac{b}{a}\right\|$ 3^{rd} **Quadrant:** $\theta = -\left[\pi - \tan^{-1}\left\|\frac{b}{a}\right\|\right]$ 4^{th} **Quadrant:** $\theta = -\tan^{-1}\left\|\frac{b}{a}\right\|$
$f(x) = d(x)q(x) + r(x)$	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
$a^2 = b^2 + c^2 - 2bc\cos A$	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
$Area = \frac{1}{2}ab\sin C$	$\vec{v} = a\mathbf{i} + b\mathbf{j}$ $\|\vec{v}\| = \sqrt{a^2 + b^2}$
$\vec{a} = a_1\mathbf{i} + a_2\mathbf{j} \quad \vec{b} = b_1\mathbf{i} + b_2\mathbf{j} \quad \theta = \cos^{-1}\left[\frac{\vec{a}\cdot\vec{b}}{\|\vec{a}\|\|\vec{b}\|}\right]$ $\vec{a}\cdot\vec{b} = a_1b_1 + a_2b_2$	$T_n = a + (n-1)d$ $S_n = \frac{n}{2}\left[2a + (n-1)d\right]$ $S_n = \frac{n}{2}(a + T_n)$ $S_\infty = \frac{a}{1-r}$
$T_n = ar^{n-1}$ $S_n = \frac{a(r^n - 1)}{r-1}, r \neq 1$	$x = \frac{\|A_x\|}{\|A\|}, \quad y = \frac{\|A_y\|}{\|A\|}$