



UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET

COURSE CODE	: FGE 1113
COURSE	: MATHEMATICS I
SEMESTER/SESSION	: 2-2024/2025 (JULY INTAKE)
DURATION	: 3 HOURS

Instructions:

1. This booklet contains **8** questions. 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 5 PRINTED PAGES INCLUDING COVER PAGE

INSTRUCTION: ANSWER ALL QUESTIONS. (100 MARKS)**QUESTION 1**

a) Simplify the following expression and express the answer using positive indices only:

i. $(3x^5y)^3$ (1 mark)

ii. $\frac{(2x\sqrt{y})^2}{6x^2y^2}$ (2 marks)

iii. $\frac{2x^5y^2 \times 3x^2y^3}{(xy)^4}$ (2 marks)

b) Solve for x :

i. $7x+5 \leq 5x-9$ (2 marks)

ii. $|9x-4|=3$ (2 marks)

iii. $|3-2x|>8$ (3 marks)

iv. $|1+4x|\leq 7$ (3 marks)

c) Solve for x for the following equation:

i. $3^{2-x} = 27^{x+1}$ (4 marks)

ii. $5^{2x+1} - 27(5^x) + 10 = 0$ (6 marks)

QUESTION 2

Given $z_1 = 3+5i$ and $z_2 = 1+i$. Compute:

a) $z_1 - 3z_2$ (2 marks)

b) $\frac{z_1}{z_2}$ (3 marks)

c) $|z_1z_2|$ (3 marks)

QUESTION 3

- a) Solve $3x^2 + 2x - 5 = 0$ by using the quadratic formula. (3 marks)
- b) Show that $x+2$ is a factor of $f(x) = 6x^3 + 13x^2 - 4$. (2 marks)
- c) Divide $x^3 + 2x^2 - 5$ with $x-2$ by using long division method. (5 marks)
- d) Express the partial fraction for $\frac{2x-3}{(x+1)(3x+2)}$. (7 marks)

QUESTION 4

Given that matrix $X = \begin{bmatrix} 3 & 0 \\ 1 & 4 \end{bmatrix}$, matrix $Y = \begin{bmatrix} -1 & 7 \\ 5 & 2 \end{bmatrix}$ and matrix $Z = \begin{bmatrix} 10 & -3 \\ 2 & 1 \end{bmatrix}$, find:

- a) $X - \frac{1}{2}Z$ (2 marks)
- b) XY (3 marks)
- c) $|YX|$ (4 marks)

QUESTION 5

- a) Given a right triangle PQR and $\tan Q = \frac{9}{13}$. Find the trigonometry ratio of $\sin Q$ and $\cos Q$. (3 marks)
- b) Find the angle of B, C and length of BC for $\triangle ABC$ given that $A = 51^\circ$, $AC = 14\text{cm}$ and $AB = 24\text{cm}$. (5 marks)
- c) Solve the following equations in the interval of $0 \leq \theta \leq 360$.
- i. $\tan \theta = -1$ (2 marks)
- ii. $\sin\left(\frac{\theta}{2}\right) = \sqrt{2}$ (5 marks)

QUESTION 6

If $\vec{a} = \mathbf{i} + 3\mathbf{j}$ and $\vec{b} = 2\mathbf{i} - 5\mathbf{j}$, find:

- a) $|\vec{a} - 2\vec{b}|$ (4 marks)
- b) the angle between \vec{a} and \vec{b} . (4 marks)

QUESTION 7

Given the geometric progression $12, 3, \dots, \frac{3}{64}$.

- a) What are the first term and common ratio. (2 marks)
b) Find the number of terms for the given sequence. (4 marks)
c) Calculate the sum of the given sequence. (2 marks)

QUESTION 8

a) Given $A = \begin{pmatrix} 3 & 2 \\ 1 & -5 \end{pmatrix}$ and $A^2 - pA + qI = 0$ where p and q are real numbers, I

is 2×2 identity matrix and 0 is a 2×2 null matrix. Determine the value of p and q . (6 marks)

- b) Tickets at a movie theater have different rates for adults and children. On Friday the theater sold 4 adult tickets and 7 children tickets for RM 83. The next day, the theater sold 5 adult tickets and 6 children tickets for RM 90. If RM x and RM y represent the price for the adult and the children ticket respectively, what is the price for the adult ticket and the price for the children ticket? (4 marks)

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

FORMULA

$x^n \cdot x^m = x^{m+n}$	$\frac{x^m}{x^n} = x^{m-n}$
$(xy)^n = x^n y^n$	$(x^n)^m = x^{mn}$
$(x)^{-n} = \frac{1}{x^n}$	$\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$
$x^{m/n} = \sqrt[n]{x^m}$	$\sqrt{\frac{x}{y}} = \frac{\sqrt{x}}{\sqrt{y}}$
$\sqrt{a \times b} = \sqrt{a} \times \sqrt{b}$	$\sqrt{a} + \sqrt{a} = 2\sqrt{a}$
$\log_a xy = \log_a x + \log_a y$	$\log_a \frac{x}{y} = \log_a x - \log_a y$
$\log_a x^n = n \log_a x$	$a^2 = b^2 + c^2 - 2bc \cos A$
$r = z = \sqrt{(a^2 + b^2)}$	$b^2 = a^2 + c^2 - 2ac \cos B$
$\theta = \text{Arg}(z) = \tan^{-1} \left \frac{b}{a} \right $	$c^2 = a^2 + b^2 - 2ab \cos C$
$z = r(\cos \theta + i \sin \theta)$	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
$f(x) = d(x)q(x) + r(x)$	$\vec{v} = a\mathbf{i} + b\mathbf{j}$
$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	$ \vec{v} = \sqrt{a^2 + b^2}$
$\vec{a} \cdot \vec{b} = a_1 b_1 + a_2 b_2$	$\theta = \cos^{-1} \left[\frac{\vec{a} \cdot \vec{b}}{ \vec{a} \vec{b} } \right]$
$T_n = a + (n-1)d$	$T_n = ar^{n-1}$
$S_n = \frac{n}{2} [2a + (n-1)d]$	$S_n = \frac{a(1-r^n)}{1-r}, r \neq 1$

