

**UNIVERSITY COLLEGE TATI (UC TATI)****FINAL EXAMINATION QUESTION BOOKLET**

COURSE CODE	: DGE 1113
COURSE	: MATHEMATICS I
SEMESTER/SESSION	: 1-2023/2024
DURATION	: 3 HOURS

Instructions:

1. This booklet contains **7** questions in SECTION A, **4** 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 7 PRINTED PAGES INCLUDING COVER PAGE

SECTION A (50 MARKS)**INSTRUCTION: ANSWER ALL QUESTIONS.****QUESTION 1**

Simplify:

a) $(4x^2y)(3x^5y^2)$ (1 mark)

b) $\frac{3x^3y^5}{xy^2}$ (1 mark)

c) $\frac{(2x^3y^2z^2)^3}{8xyz^3}$ (2 marks)

QUESTION 2Solve for x .

a) $2x+5 \leq 3-5x$ (2 marks)

b) $5x-2 \leq 7-2x \leq x+5$ (3 marks)

c) $|3x-6| \leq 4$ (3 marks)

QUESTION 3Given $Z_1 = 3+i$ and $Z_2 = 1-2i$.a) Find each of the following and give the answer in standard form, $a+bi$.

(i) $Z_1 + 2Z_2$ (2 marks)

(ii) $\frac{Z_1}{Z_2}$ (3 marks)

b) Find $|Z_1Z_2|$. (3 marks)

QUESTION 4

A cylindrical glass has a radius of 4cm . If 603cm^3 of water is added to the glass, find the depth of the water in the glass to the nearest whole number. (3 marks)

QUESTION 5

- a) Determine whether or not $(x-3)$ is a factor of $f(x)$ by using factor theorem.
- i) $f(x) = 3x^3 - 9x^2 - x + 3$ (1 mark)
- ii) $f(x) = 2x^3 - 2x$ (1 mark)
- b) By using quadratic formula, solve $6x^2 - x - 2 = 0$. (3 marks)
- c) Divide $x^3 + 3x^2 + 4x - 1$ by $(x-1)$ using long division. (4 marks)

QUESTION 6

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

- a) $2A + 3B - C$ (3 marks)
- b) AB (3 marks)
- c) BC (3 marks)

QUESTION 7

- a) Given a right triangle ABC and $\sin A = \frac{8}{19}$. Find the trigonometry ratio of $\tan A$ and $\cos A$. (4 marks)
- b) In triangle ABC , given $\angle A = 85^\circ$, $\angle B = 70^\circ$ and $a = 8\text{cm}$. Find $\angle C$, side b and c by using sine rule. (5 marks)

SECTION B (30 MARKS)**INSTRUCTION: ANSWER ALL QUESTIONS.****QUESTION 1**Solve for x .

$$5^{2x+1} - 27(5^x) + 10 = 0 \quad (5 \text{ marks})$$

QUESTION 2Express $\frac{2x+3}{(x+1)(3x-2)}$ as a partial fraction. (5 marks)**QUESTION 3**

- a) Solve $\sin \theta = 5 \sin \theta + 2$ in the interval of $0^\circ \leq \theta \leq 360^\circ$ (3 marks)
- b) Solve $3 \tan \theta + 2 = 1$ in the interval of $0^\circ \leq \theta \leq 360^\circ$ (3 marks)

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

- a) $4\vec{b} - 3\vec{a}$ (3 marks)
- b) $|\vec{a} + \vec{b}|$ (3 marks)
- c) $\vec{a} \times \vec{b}$ (3 marks)
- d) the angle between the vectors \vec{a} and \vec{b} . (5 marks)

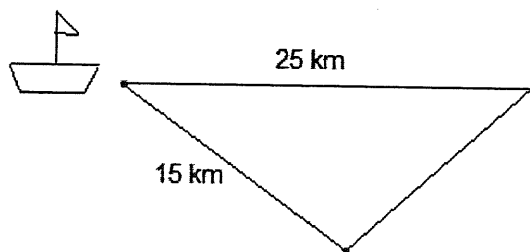
SECTION C (20 MARKS)**INSTRUCTION: ANSWER ALL QUESTIONS.****QUESTION 1**

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?

(6 marks)

QUESTION 2

- a) Kota Bharu is 294 km from Kemaman. Kemaman is 257 km from Bentong, which is 369 km from Kota Bharu. If you are in Bentong, what is the angle formed between Kota Bharu and Kemaman? Round your answer to the nearest degree. (3 marks)
- b) A boat leaves Kuala Terengganu and heads due east for 25 km. At the same time, a second boat travels in a direction 30° south of east from Kuala Terengganu for 15 km. How far apart are the boats at this moment when they reach their destinations?



(3 marks)

QUESTION 3

A standard tennis ball has a diameter of 6.7cm .

- a) What is the volume of the tennis ball? (2 marks)
- b) What is the surface area of the tennis ball? (2 marks)
- c) If three of them fit into a tube with radius of 3.5cm and a height of 21cm , how much empty space is there? (4 marks)

-----End of question-----

FORMULA

$ a = \begin{cases} a, & a \geq 0 \\ -a, & a < 0 \end{cases}$	i. If $ x < a$, then $-a < x < a$ ii. If $ x > a$, then $x > a$ or $x < -a$	$\sqrt{a \times b} = \sqrt{a} \times \sqrt{b}$ $a\sqrt{b} \pm c\sqrt{b} = (a \pm c)\sqrt{b}$
$x^n \cdot x^m = x^{m+n}$ $\frac{x^m}{x^n} = x^{m-n}$ $(x^n)^m = x^{mn}$ $(xy)^n = x^n y^n$	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $f(x) = q(x)d(x) + r(x)$	$ \vec{v} = \sqrt{a^2 + b^2}$ $\hat{u} = \frac{\vec{a}}{ \vec{a} }$ $\theta = \cos^{-1} \left(\frac{\vec{a} \cdot \vec{b}}{ \vec{a} \vec{b} } \right)$
$\log_a xy = \log_a x + \log_a y$ $\log_a x^n = n \log_a x$ $\log_a \frac{x}{y} = \log_a x - \log_a y$ $\log_a c = \frac{\log_b c}{\log_b a}$	$a^2 = b^2 + c^2 - 2bc \cos A$ $\frac{a}{\sin A} = \frac{b}{\sin B}$ $\text{Area} = \frac{1}{2} ab \sin C$ $c^2 = a^2 + b^2$	$X = A^{-1}B$ $ A = ad - bc$ $A^{-1} = \frac{1}{ A } \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$ $X = \frac{ A_x }{ A } \quad Y = \frac{ A_y }{ A }$
$\theta = \tan^{-1} \left \frac{b}{a} \right $ $\theta = \pi - \tan^{-1} \left \frac{b}{a} \right $ $\theta = - \left[\pi - \tan^{-1} \left \frac{b}{a} \right \right]$ $\theta = - \tan^{-1} \left \frac{b}{a} \right $	$A = 4\pi r^2$ $V = \frac{4}{3} \pi r^3$ $A = 2\pi r h + 2\pi r^2$ $V = \pi r^2 h$	$A = \frac{1}{2} bh$ $A = \sqrt{s(s-a)(s-b)(s-c)}$ $s = \frac{1}{2}(a+b+c)$ $p = 2\pi r$ $A = \pi r^2$ $A = hb$
$A = \frac{1}{2}(a+b)h$ $V = \frac{1}{3} \pi r^2 h$	$m = \frac{(y - y_1)}{(x - x_1)}$ $y - y_1 = m(x - x_1)$	$ z = a + bi = \sqrt{a^2 + b^2}$ $z = z (\cos \theta + i \sin \theta)$

