CONFIDENTIAL

UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET

COURSE CODE	:	DGE 1113
COURSE	:	MATHEMATICS I
SEMESTER/SESSION	:	2 – 2024/2025
DURATION	:	3 HOURS

Instructions:

1. This booklet contains **8** questions. Answer **ALL** questions.
2. All answers should be written in the answer booklet.
3. Write legibly and draw sketches whenever required.
4. If in doubt, raise your hand 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

INSTRUCTION: ANSWER ALL QUESTIONS. (100 MARKS)

QUESTION 1

a) Simplify $\sqrt{50}+\sqrt{18}-3\sqrt{2}$ (3 marks)

b) Simplify:

i) $(2x^3y)(3x^2y^4)$ (1 mark)

ii) $\dfrac{6x^3y^5}{3xy^2}$ (1 mark)

c) Solve the following equations.

i) $|3x+2|<8$ (3 marks)

ii) $5x-2\le 7-2x\le x+5$ (3 marks)

iii) $\dfrac{27^{2x-2}}{3^x}=9$ (4 marks)

d) If $\log_x 2 = 0.631$ and $\log_x 5 = 1.465$, find the value of each expression.

i) $\log_x 8$ (3 marks)

ii) $\log_x \sqrt{10}$ (4 marks)

QUESTION 2

Given $z_1 = 4-6i$ and $z_2 = 3-7i$.

a) Find each of the following and give the answer in standard form, $a+bi$.

i) $2z_1 + z_2$ (2 marks)

ii) $\dfrac{z_1}{z_2}$ (3 marks)

b) Find $|z_1 z_2|$ (3 marks)

QUESTION 3

a) Determine whether or not $(x-2)$ is a factor of $f(x)$ by using factor theorem.

i) $f(x)=2x^3+3x^2-8x+3$ (1 mark)

ii) $f(x)=x^2+2x-8$ (1 mark)

b) By using quadratic formula, solve $x^2-2x-15=0$. (3 marks)

c) Divide x^3-5x^2+2x+8 by $(x+1)$ using long division (5 marks)

d) Express $\dfrac{x-13}{(x+2)(x-3)}$ as a partial fraction. (5 marks)

QUESTION 4

a) Given that matrix $A=\begin{bmatrix}-3 & 1\\ 2 & 0\end{bmatrix}$, $B=\begin{bmatrix}1 & 4\\ 5 & 3\end{bmatrix}$ and $C=\begin{bmatrix}1 & 2\\ 6 & 4\end{bmatrix}$. Find:

i) $3A+3B-C$ (3 marks)

ii) AB (3 marks)

iii) $|AB|+|C|$ (3 marks)

QUESTION 5

a) Given a right triangle ABC and $\tan A = \frac{8}{6}$. Find the trigonometry ratio of $\sin A$ and $\cos A$. (4 marks)

b) i) Calculate the area of ΔABC, given that $a = 21, b = 15$ and $C = 75.16°$.

(2 marks)

ii) Calculate the area of ΔABC, given that $A = 113°, b = 18.5cm$ and $c = 23.7cm$.

(2 marks)

c) Solve the triangle ABC given $a = 70cm$, $\measuredangle B = 62°$ and $\measuredangle C = 45°$. Find $\measuredangle A$, side b and c by using sine rule. (5 marks)

d) Solve $5 + \tan\theta = 4$ in the interval of $0° \le \theta \le 360°$. (3 marks)

e) From the top of a lighthouse, 120 ft above the sea, the angle of depression of a boat is $15°$. How far is the boat from the lighthouse?

(4 marks)

QUESTION 6

Given two vectors, $\vec{u} = \mathbf{i} - 2\mathbf{j} + 3\mathbf{k}$ and $\vec{v} = -2\mathbf{i} + 3\mathbf{j} + 2\mathbf{k}$. Find:

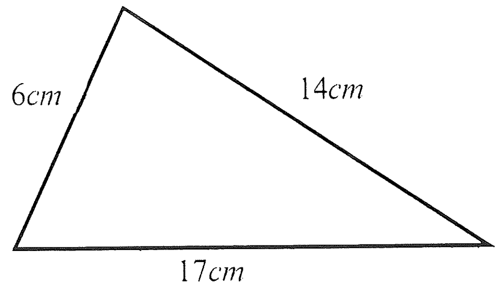
a) $\vec{u} - \vec{v}$ (2 marks)

b) $|3\vec{u} + 3\vec{v}|$ (3 marks)

c) the angle between $\vec{u}$ and $\vec{v}$ (4 marks)

QUESTION 7

a) Given a triangle, find:



i) the perimeter of a triangle (1 mark)

ii) the area of a triangle using Heron's formula (3 marks)

b) A standard soccer ball has a diameter of 22 cm.

i) Find the surface area of the soccer ball? (2 marks)

ii) Find the volume of the soccer ball? (2 marks)

iii) If three of these soccer balls are packed into a cylindrical container with the same radius as the soccer balls and a height of 66 cm, how much empty space is left in the container? (4 marks)

QUESTION 8

At a candy shop, the price of a chocolate bar is different from the price of a lollipop. On Monday, the shop sold 2 chocolate bars and 3 lollipops for a total of RM 19. On Tuesday, the shop sold 4 chocolate bars and 5 lollipops for a total of RM 37. If x represents the price of a chocolate bar and y represents the price of a lollipop, what is the price of a chocolate bar and the price of a lollipop? Use **Cramer's Rule** to solve the system.

(5 marks)

-- **END OF QUESTIONS** --

FORMULA

$x^m \cdot x^n = x^{m+n}$ $\dfrac{x^m}{x^n} = x^{m-n}$	$\sqrt{a \times b} = \sqrt{a} \times \sqrt{b}$ $\sqrt{a} + \sqrt{a} = 2\sqrt{a}$
$r = \lvert z \rvert = \sqrt{(a^2 + b^2)}$ $\theta = Arg(z) = \tan^{-1}\left\lvert \dfrac{b}{a} \right\rvert$ $z = r(\cos\theta + i\sin\theta)$	$H^2 = O^2 + A^2$ $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$ $Area = \dfrac{1}{2}ab\sin C = \dfrac{1}{2}ac\sin B = \dfrac{1}{2}bc\sin A$
$\dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $\dfrac{P(x)}{D(x)} = Q(x) + \dfrac{R(x)}{D(x)}$	$\vec{v} = v_1\mathbf{i} + v_2\mathbf{j}$ $\lvert \vec{v} \rvert = \sqrt{a^2 + b^2}$ $\vec{u} + \vec{v} = (u_1 + v_1, u_2 + v_2, u_3 + v_3)$ $\theta = \cos^{-1}\left[\dfrac{\vec{a} \cdot \vec{b}}{\lvert \vec{a} \rvert \lvert \vec{b} \rvert} \right]$
$x = \dfrac{\lvert A_x \rvert}{\lvert A \rvert}, y = \dfrac{\lvert A_y \rvert}{\lvert A \rvert}$	
$P = a + b + c$	$A = \sqrt{s(s-a)(s-b)(s-c)}$ where $s = \dfrac{1}{2}(a + b + c)$
Area of circle, $A = \pi r^2$ Volume of cylinder, $V = \pi r^2 h$	Surface area of sphere, $SA = 4\pi r^2$ Volume of sphere, $V = \dfrac{4}{3}\pi r^3$