UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: DGE 1113
COURSE	: MATHEMATICS I
SEMESTER/SESSION	: 1- 2022/2023 (APRIL INTAKE)
DURATION	: 3 HOURS

Instructions:

1. This booklet contains 11 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 7 PRINTED PAGES INCLUDING COVER PAGE

SECTION A (50 MARKS)

INSTRUCTION: ANSWER ALL QUESTIONS.

QUESTION 1

Find the values of x satisfying the following inequalities:

a) $4x+3>2(3x-1)$. (2 marks)

b) $5-\frac{x}{3}<9$. (2 marks)

c) $\frac{x}{x-5}>\frac{1}{2}$. (2 marks)

d) $|4-2x|=12$. (2 marks)

e) $2|3x-1|-1\leq 7$. (2 marks)

QUESTION 2

Express the following in the form of $a+bi$.

a) $(4-3i)+(7-5i)$. (2 marks)

b) $(3-7i)-(-8-5i)$ (2 marks)

c) $-7i(8+11i)$. (2 marks)

QUESTION 3

Given $A=\begin{bmatrix}3 & -7\\ 1 & -2\end{bmatrix}$, $B=\begin{bmatrix}1 & 1\\ 1 & -1\\ 2 & 0\end{bmatrix}$ and $C=\begin{bmatrix}3 & 2\\ -2 & 1\end{bmatrix}$. Calculate :

a) BC. (3 marks)

b) The inverse of A. (3 marks)

c) $2A-CA$. (4 marks)

QUESTION 4

What is the remainder when the polynomials $p(x)=5x^4+6x^3+x^2+2x+2$ is divided by $(x-2)$. Is $(x+1)$ a factor of $p(x)$? (4 marks)

QUESTION 5

Figure 1 below shows $BC=5$, $\measuredangle BCD=40°$ and $\measuredangle BDC$ is a right angle. Find :

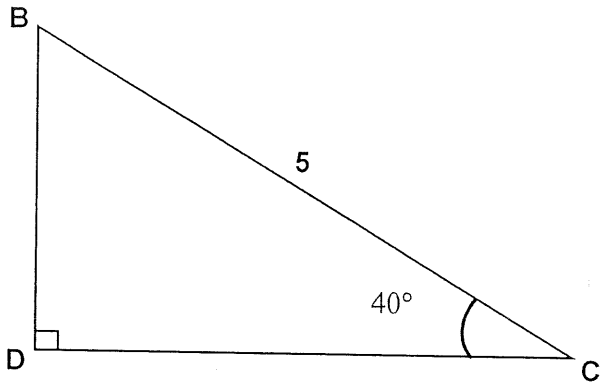


Figure 1

a) The length of BD. (3 marks)

b) The length of DC. (3 marks)

c) The angle of DBC. (2 marks)

QUESTION 6

Given vector $\vec{a}=-2\hat{i}+5\hat{j}-6\hat{k}$, $\vec{b}=7\hat{i}-4\hat{j}$ and $\vec{c}=3\hat{j}-2\hat{k}$, compute:

a) The vector $-2\vec{a}-3\vec{b}$. (3 marks)

b) The vector $\vec{c}+5\vec{b}$. (2 marks)

c) $\vec{a}\times 3\vec{c}$. (3 marks)

QUESTION 7

Find the surface area of the closed cylinder given in Figure 2 below. Give your answer to 2 decimal places.

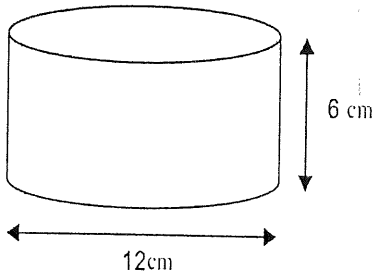


Figure 2

(4 marks)

SECTION B (30 MARKS)

INSTRUCTION: ANSWER ALL QUESTIONS.

QUESTION 1

a) Solve $\log_4(5x-1)=3$. (4 marks)

b) Express $\frac{5+i}{2+3i}$ in standard form $a+bi$, then write the complex number in polar form. (4 marks)

c) Use long division to solve $(2x^3-5x^2+x-10)\div(x^2-4x+1)$. (4 marks)

d) Express $\frac{7x^2+11x+46}{(x+2)(x^2+9)}$ as partial fractions. (6 marks)

e) Given a triangle ABC where $\angle A=54°$, $\angle B=27°$ and $b=3$ cm. Find the length of a? (3 marks)

QUESTION 2

Solve the value of θ in the interval of $0\le\theta\le360°$ for the following equations:

a) $2\cos\theta+\sqrt{3}=0$. (3 marks)

b) $2\sin\theta+\sqrt{2}=0$. (3 marks)

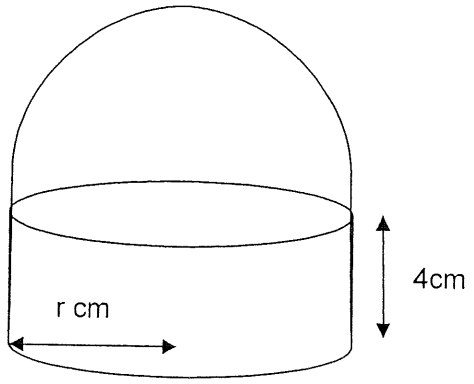
c) $\sqrt{3}\tan\frac{\theta}{2}=-1$. (3 marks)

SECTION C (20 MARKS)

INSTRUCTION: ANSWER ALL QUESTIONS.

QUESTION 1

In the diagram, the solid is made up of a right circular cylinder and a hemisphere. If both the right circular cylinder and the hemisphere have the same volume, find the value of r. Then, calculate the surface area for the diagram.



(10 marks)

QUESTION 2

a) Suppose you are selling hamburgers for RM 5 and pizza for RM6 during a football game. You know that you have sold a total of 100 hamburgers and pizza and made RM 520 during the game, but you forgot to keep track how many of each you have sold. To predict well for the next time, you need to know, how many hamburgers and how many pizzas that you have sold on that day. Use Cramer's method to calculate the value. (6 marks)

b) If $\vec{a} = (8-x, 6-y, 6)$ and $\vec{b} = (x-4, y+2, 6)$ are two equivalent vectors, find the value of x and y. (4 marks)

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

FORMULA

$x^m \times x^n = x^{m+n}$

$x^m \div x^n = x^{m-n}$

$\left(x^m\right)^n = x^{mn}$

$(xy)^n = x^n \cdot y^n$

$x^{\frac{1}{n}} = \sqrt[n]{x}$

$\sqrt[n]{xy} = \sqrt[n]{x}\sqrt[n]{y}$

$x^{-n} = \frac{1}{x^n}$

$\log_a xy = \log_a x + \log_a y$

$\log_a \frac{x}{y} = \log_a x - \log_a y$

$\log_a x^n = n \log_a x$

$\log_a a = 1$

$\log_a 1 = 0$

$a^{\log_a(x)} = x$

$r = |z| = \sqrt{a^2 + b^2}$

$\theta = \tan^{-1}\left|\frac{b}{a}\right|$

$z = r(\cos\theta + i\sin\theta)$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$P(x) = D(x)Q(x) + R(x)$

$A^{-1} = \frac{1}{ad - bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

$X = A^{-1}B$

$x = \frac{|A_x|}{|A|}, y = \frac{|A_y|}{|A|}$

$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

$Area = \frac{1}{2}ab\sin C = \frac{1}{2}ac\sin B = \frac{1}{2}bc\sin A$

$a^2 = b^2 + c^2 - 2bc\cos A$

$b^2 = a^2 + c^2 - 2ac\cos B$

$c^2 = a^2 + b^2 - 2ab\cos C$

$|\vec{u}| = \sqrt{u_1^2 + u_2^2 + u_3^2}$

$\hat{u} = \frac{\vec{u}}{|\vec{u}|}$

$\theta = \cos^{-1}\left[\frac{\vec{u}.\vec{v}}{|\vec{u}||\vec{v}|}\right]$

$A = \sqrt{s(s-a)(s-b)(s-c)}$ where $s = \frac{1}{2}(a+b+c)$

$P = a + b + c$

$A = \frac{1}{2}bh$

Circumference, $C = 2\pi r$

Area of a circle, A = πr^2

Surface Area of a cylinder, SA = $2\pi rh + 2\pi r^2$

Volume of a cylinder, V = $\pi r^2 h$

Surface Area of a sphere, SA = $4\pi r^2$

Volume of a sphere, V = $\frac{4}{3}\pi r^3$