MACHAKOS UNIVERSITY

University Examinations for 2024/2025 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES
DEPARTMENT OF MATHEMATICS AND STATISTICS

FIRST YEAR FIRST SEMESTER EXAMINATION FOR DEGREE IN BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY BACHELOR OF SCIENCE IN COMPUTER SCIENCE

SCO 110/SIT 100: MATHEMATICS FOUNDATION FOR IT/COMPUTER SCIENCE

DATE: 22ND JANUARY, 2025 **TIME: 2.00 PM – 4.00 PM**

INSTRUCTIONS:
Answer question ***ONE (Compulsory)*** *and* ***any other TWO*** *questions*

QUESTION ONE *(COMPULSORY)* (30 MARKS)

a) Evaluate the following

i) $\frac{1}{1+cos45}$ (3mks)

ii) $\frac{log\ 75+log\ 9+log\ 5}{log\ 5+log\ 45}$ (3mks)

b) Solve $5x^2 - 6x - 2 = 0$ by completing the square method (3mks)

c) Express $f(x) = 2x^2 - 12x + 23$ in the form $f(x) = a(x-p)^2 + q$ and determine its least (minimum) or greatest (maximum) value. (5mks)

d) The roots of the equation $3x^2 + 4x - 5 = 0$ are α and β. Find the values of $\frac{1}{\alpha} + \frac{1}{\beta}$ (3mks)

e) Find the remainder if $f(x) = x^5 - 4x^3 + 2x + 3$ is divided by $(x-1)$ (3mks)

f) Solve the equation $1 + cos\theta = 2sin^2\theta, 0 \leq \theta \leq 360$ (6mks)

g) Express the complex numbers in polar form $z = 1 + \sqrt{3}i$ (4mks)

QUESTION TWO (20 MARKS)

a) Given that $z_1 = 5 + i$ and $z_2 = 8 - i$, find $\frac{z_1}{z_2}$ (5mks)

b) i) State the De moivres theorem (2mks)

ii) Prove that $sin\ sin\ 3\theta = 3sin\theta - 4sin^3\theta$ (8mks)

c) Given that $z = -\sqrt{6} - \sqrt{2}i$, find z^5 (5mks)

QUESTION THREE (20 MARKS)

a) Given that $\sqrt{35} = 5.9160798$, evaluate $\frac{\sqrt{7}-\sqrt{5}}{\sqrt{7}+\sqrt{5}}$ (4mks)

b) How many different arrangements can be made by using all the letters of the word MISSISSIPPI (4mks)

c) Expand up to the fourth term of $(2x - 3)^{14}$ (4mks)

d) The roots of the equation$2x^2 - 7x + 4 = 0$ are $\propto$ and β. Find the equation with integral coefficient whose roots are $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$ (8mks)

QUESTION FOUR (20 MARKS)

a) Split the following in to partial fractions $f(x) = \frac{11-3x}{x^2+2x-3}$ (6mks)

b) Determine the inverse for the function ; $f: x \to \frac{4x+5}{7x-7}; x \neq 1$ (4mks)

c) If $f: R \to R$ and $g: R \to R$ defined by $f: x \to 2x + 1$ and $g: x \to x - 3$ respectively. Determine

i) $f \circ g$ (3mks)

ii) $g \circ f$ (3mks)

iii) $f^{-1} \circ g^{-1}$ (4mks)

QUESTION FIVE (20 MARKS)

a) Find without using tables or calculators the value of $sin\ 165$ (5mks)

b) Solve the equation $sin2\theta cos\theta + sin^2\theta = 1$ (10mks)

c) State the Factor theorem and hence apply it to $2x^3 + 3x^2 - 32x + 15 = 0$ (5 mks)