(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

UNIVERSITY MAIN EXAMINATIONS

2021/2022 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER EXAMINATIONS

FOR THE DEGREE
OF

BACHELOR OF GEOSPATIAL INFORMATION SCIENCE

COURSE CODE: MAT 108 COURSE TITLE: ALGEBRA

DATE: FRIDAY 29TH APRIL, 2022 **TIME: 12.00PM-2.00PM**

INSTRUCTIONS TO CANDIDATES

Answer question **ONE** (COMPULSORY) and any other **TWO** questions

Time: 2 hours

QUESTION THREE (20 MARKS)

(a) Find the three cube roots of $Z = 5(\cos 225^o + j \sin 225^o)$ (5 marks)

(b) Use mathematical induction to prove that $|Sinnx| \leq n|Sinx|$ for any real number x and natural number n. (6 marks)

(c) Find the number of permutations and combinations if $n=12$ and $r=2$. (4 marks)

(d) In how many ways a committee consisting of 5 men and 3 women can be chosen from 9 men and 12 women. (5 marks)

QUESTION FOUR (20 MARKS)

(a) (i) Simplify the expression $\frac{\sqrt{15}}{\sqrt{5}-\sqrt{3}} - \frac{\sqrt{15}}{\sqrt{5}+\sqrt{3}}$ giving your answer in the form $a+2\sqrt{c}$ (3 marks)

(ii) Factorise $4x^2+7x+3$ and hence solve $4x^2+7x+3=0$ (3 marks)

(iii) Find the remainder when $x+1$ divides $3x^3+x^2+2x+5$ (2 marks)

(b) The 20^{th} term in an arithmetic sequence is 60 and the 16^{th} term is 20. Find the first term and the common difference. (4 marks)

(c) The fourth term of a geometric sequence is 8 and the 6^{th} term is 32. Determine the two possible common ratios. (4 marks)

(d) Find the rate per annum at which a certain amount of money doubles after being invested for a period of 5 years compounded annually. (4 marks)

QUESTION FIVE (20 MARKS)

(a) Expand $\left(1+\frac{1}{2}x\right)^{10}$ up to the term in x^3 in ascending powers of x. Use the expansion to estimate $(0.005)^{10}$ correct to 4 decimal places (6 marks)

(b) Simplify $\sqrt[3]{\frac{64x^9y^6}{y^3x^6}}$ (2 marks)

(c) Solve for x if $2+\log_3 3+\log_3 x = \log_3 5+1$ (4 marks)

(d) Find the integral values of x for which $2x+5>9$ and $8-x \geq 3$ (4 marks)

(e) Given that $ax^2+bx+c=0$ show that $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ (4 marks)