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KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY

UNIVERSITY EXAMINATION, 2023/2024 ACADEMIC YEAR
FIRST YEAR, FIRST SEMESTER EXAMINATION
FOR THE DEGREE OF BACHELOR OF BUSINESS AND INFORMATION TECHNOLOGY

Date: 6th December, 2023
Time: 8.30am – 10.30am

KMA 2103 - BASIC MATHEMATICS

INSTRUCTIONS TO CANDIDATES

ANSWER **QUESTION ONE (COMPULSORY)** AND **ANY OTHER TWO** QUESTIONS

QUESTION ONE (30 MARKS)

a) Solve for x if $\left(\frac{2}{3}\right)^x = \frac{1}{16}$.

(3 marks)

b) Prove that, if the sum of the squares of the roots of the equation $ax^2 + bx + c = 0$ is 1, then $b^2 = 2ac + a^2$.

(3 marks)

c) A polynomial $f(x)$ has remainder 9 when divided by $(x - 3)$ and remainder -5 when divided by $(2x + 1)$. Find the remainder when divided by $(x - 3)(2x + 1)$.

(3 marks)

d) Solve the equation $2\,log_5 x + 2\,log_x 5 = 5$

(4 marks)

e) Simplify $\frac{\sqrt{xy} \times x^{\frac{1}{8}} \times 2y^{\frac{1}{4}}}{(x^{10}y^{9})^{\frac{1}{12}}}$

(4 marks)

f) Find without table or calculators the value of $-Sin\,45Sin57 + 3Cos33Cos60$

(3 marks)

g) The eighth and fifth terms of a G.P are 4374 and 162 respectively. Determine the seventh term.

(3 marks)

h) Solve the following quadratic equation;

i) $x^2 + 15x + 54 = 0$ by factorization method

(3 marks)

ii) $x^2 - 5x - 1 = 0$ by completing squares method

(4 marks)

QUESTION TWO (20 MARKS)

a) Rationalize the denominator in $\frac{3}{\sqrt[5]{2}}$ (2 marks)

b) Expand $(1-3x)^8$ up to the term in x^5 hence use your expansion to estimate $(0.998)^8$ correct to five decimal places. (4 marks)

c) Factorize completely the expression $x^4+5x^3+5x^2-5x-6$ hence solve the equation $x^4+5x^3+5x^2-5x-6=0$ (4 marks)

d) The roots of the equation $2x^2-4x+1=0$ are α and β. Find an equation with integral co-efficient whose roots are $2-\alpha$ and $2-\beta$ (4 marks)

e) Show that $log_{3^n}\, x = \frac{1}{n} log_3\, x$.

Hence solve the equation $log_{81}\, x + log_3\, x + log_{\sqrt{3}}\, x = 13$ (7 marks)

f) Determine the number of permutations of the letters of the word **POPULATION.** (3 marks)

QUESTION THREE (20 MARKS)

a) How many even numbers greater than 50000 can be formed using the digits 0,3,4,5,6,7

i) without repetitions (6 marks)

ii) if repetitions are allowed (4 marks)

b) Find the first four terms in the expansion of $(1-8x)^{\frac{1}{2}}$ in ascending powers of x. Hence, substitute $x=\frac{1}{100}$ and obtain the value of $\sqrt{23}$ correct to 5 significant figures. (6 marks)

c) State the quotient and the remainder when $6x^3-8x+5$ is divided by $2x-4$. (4 marks)

QUESTION FOUR (20 MARKS)

a) Find y in terms of x if $log\left(\frac{x^2}{y}\right) = 5 - 2\log x$ (4 marks)

b) A customer makes deposits of *Ksh*.10,000 on first January every year for four years. How much is the investment worth at the end of the four years if it attracts a compound interest of 12% per annum? (6 marks)

c) Show that $\tan(A+B)=\dfrac{\tan A+\tan B}{1-\tan A\tan B}$ (6 marks)

d) Find the value of $\log_3 \dfrac{1}{27}$ (4 marks)

QUESTION FIVE(20 MARKS)

a) The second and fifth terms of an arithmetic series are 26 and 41 respectively.

i) Show that the common difference of the series is 5 (4 marks)

ii) Find the 12th term of the series (3 marks)

iii) Another arithmetic series has first term -12 and common difference 7. Given that the sums of the first n terms of these two series are equal, find the value of n. (3 marks)

b) Use the Pascal's triangle to expand $(2x-3)^7$ (5 marks)

c) A committee of six is to be formed from nine women and three men. In how many ways can the members be chosen so as to include at least one man? (5 marks)