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KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATIONS, 2024/2025 ACADEMIC YEAR
FIRST YEAR, FIRST SEMESTER EXAMINATION
FOR THE DEGREE OF BACHELOR OF SCIENCE IN MATHEMATICS

KMA 2100: FOUNDATION MATHEMATICS

Date: 4TH DECEMBER, 2024

Time: 11:30AM-1:30PM

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE: COMPULSORY (30 MARKS)

- a) Solve without using tables or a calculator

$$\frac{\log_{10} 75 + \log_{10} 9 + \log_{10} 5}{\log_{10} 5 + \log_{10} 45}$$

(3 Marks)

- b) A group of young men decided to raise **Ksh. 480,000** to start a business. Before the actual payment was made, four members pulled out and each of those remaining had to pay an additional **Ksh. 20,000**.

Determine the original number of members.

(4 Marks)

- c) Write $40 \times 39 \times 38 \times 37$ in factorial notation.

(1 Mark)

- d) Write down the coefficients of the terms indicated in the expansion of the following;

(i) $(1 + x)^{16}$, 3rd term

(3 Marks)

(ii) $(2 - x)^{20}$, 18th term

(3 Marks)

- e) Find how many different arrangements of 11 letters can be obtained from the letters of the word **MISSISSIPPI**

(3 Marks)

- f) 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)

- g) In an arithmetic progression the 4th term is 13 and the 7th term is 22. Find;

(i) The first term and the common difference

(2 Marks)

(ii) The value of n if the n^{th} term is 100

(2 Marks)

(iii) The value of m if the sum of m terms of the series is 175.

(3 Marks)

- h) The roots of the equation $5x^2 + 12x + 6 = 0$ are α and β . Find the equation of the integral coefficients whose roots are $(\alpha - 1)$ and $(\beta - 1)$.

(3 Marks)

QUESTION TWO: (20 MARKS)

- a) Simplify $\frac{\frac{1}{2}x^2(1+x)^{-\frac{1}{2}} - \frac{1}{2}x^{-\frac{1}{2}}(1+x)^{\frac{1}{2}}}{x}$ (4 Marks)
- b) Use Complete the square method to solve for x in the function $x^2 + x + 1 = 0$ (4 Marks)
- c) If $0 < x < \pi$ and $\tan(X - A) = 3$, where $\tan A = 2$, show that $x = \frac{3}{4}\pi$ without using tables. (4 Marks)
- d) Find the first four terms in the expansion of $\sqrt{1 - 8x}$ in ascending power of x . Hence, substitute $x = 0.01$ and obtain the value of 23 correct to four significant figures (8 Marks)

QUESTION THREE: (20 MARKS)

- a) Solve for x given $\log_2 1 + \log_4 \frac{1}{2} = \log_9 x$ (4 Marks)
- b) Show that the solution of the general quadratic equation $ax^2 + bx + c = 0$ is given by $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Hence solve the equation $x^2 + 15x + 56 = 0$. (7 Marks)
- c) Find the general solution of the equation $\cos 2x - 3 \cos x + 2 = 0$ (7 Marks)
- d) State the quotient and the remainder when $9x^3 - 5x + 5$ is divided by $2x - 5$ (2 Marks)

QUESTION FOUR: (20 MARKS)

- a) Show that $\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$ (6 Marks)
- b) 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)
- c) Simplify without using tables or calculator;
 $4\cos 30^\circ \sin 27.59^\circ - 4\sin 45^\circ \cos 62.41^\circ - 16\tan 45^\circ \sin 60^\circ$ (4 Marks)

QUESTION FIVE: (20 MARKS)

- a) Simplify $\frac{\sqrt{xy} \times x^{\frac{1}{3}} \times 2y^{\frac{1}{4}}}{(x^{10}y^9)^{\frac{1}{12}}}$ (3 Marks)
- b) The first term of an arithmetic progression is -12 , and the last term is 40 . If the sum of the progression is 196 , find the number of terms and the common difference. (5 Marks)
- c) *Ksh.* 100,000 was invested on 1st January 1990. An additional of *Ksh.* 6,000 was added to the investment at the beginning of each subsequent year. The investment earns a compound interest of 8% per annum. Find the value of the investment on 31st December 2000. (7 Marks)
- d) Find the first four terms in the expansion of $(1 - 8x)^{\frac{1}{3}}$ in ascending powers of x . Hence, substitute $x = \frac{1}{100}$ and obtain the value of $\sqrt[3]{23}$ correct to 5 significant figures (5 Marks)