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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 INFORMATION TECHNOLOGY
KMA 2103 - BASIC MATHEMATICS

Date: 15th August, 2023
Time: 8.30 – 10.30am

INSTRUCTIONS TO CANDIDATES
ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 MARKS)

a) Without using tables or calculator, evaluate $\frac{\sqrt{7}-\sqrt{5}}{\sqrt{7}+\sqrt{5}}$ correct to 6 decimal places given that $\sqrt{35} = 5.9160798$ (4 Marks)

b) Find the remainder when $x^5 - 4x^3 + 2x + 3$ is divided by $2x - 1$ (3 Marks)

c) Determine the number of permutations of the letters of the word **IMPERIALISM** (3 Marks)

d) Use the Pascal's triangle to expand $(-4x^2 - 3)^3$ (4 Marks)

e) If the roots of the equation $3x^2 - 5x + 1 = 0$ are α and β, find the equation whose roots are $\alpha^3\beta$ and $\alpha\beta^3$ (4 Marks)

f) Solve the following quadratic equation by the method of completing the square $2x^2 + 8x - 25 = 0$ (3 Marks)

g) Express $7\sqrt[4]{3}$ in the form $\sqrt[4]{P}$ where p is an integer. (3 Marks)

h) If $\log_{10} 2 = a$, show that $\log_8 5 = \frac{1-a}{3a}$ (3 Marks)

i) Show that $2SinBCosA = Sin(A+B) - Sin(A-B)$ (3 Marks)

QUESTION TWO (20 MARKS)

a) 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 (5 Marks)

b) A single deposit of Ksh. 150,000 is invested for four years at a compound interest. Determine the rate at which the investment will be Ksh. 182,326 (4 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? (4 Marks)

d) Solve $ax^2 + bx + c = 0$ by completing the square method where a, b and c are real numbers, $a \neq 0$. (4 Marks)

e) Use the results obtained in (d) above to solve $2x^2 - 4x + 7$ (3 Marks)

QUESTION THREE (20 MARKS)

a) Obtain the first four terms of the expansion $\left(1+\frac{1}{2}x\right)^{10}$ in ascending powers of x. Hence, find the value of $(1.005)^{10}$, correct to four decimal places. (6 Marks)

b) How many even numbers greater than 50 000 can be formed using the digits 0, 3, 4, 5, 6, and 7
   i) Without repeating digits
   ii) If repeating digits is allowed? (8 Marks)

c) Simplify $\dfrac{(1+x)^{\frac{1}{3}}-\frac{1}{3}x(1+x)^{-\frac{2}{3}}}{(1+x)^{\frac{2}{3}}}$ (6 Marks)

QUESTION FOUR (20 MARKS)

a) Solve for x if $\log_3 x+\log_9 x^2=6$ (4 Marks)

b) Show that $\tan(A+B)=\dfrac{\tan A+\tan B}{1-\tan A\tan B}$ (8 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 $(x-3)(2x+1)$. (8 Marks)

QUESTION FIVE (20 MARKS)

a) Draw the graph of $y=2x^2-12x+19$ for $1\le x\le 5$. By adding suitable lines to your graph
   i) Solve the equation $x^2-6x+6=0$
   ii) Solve the equation $4x^2-25x+28=0$ (10 Marks)

b) If $0<x<\prod$ and $\tan(X-A)=3$, where $\tan A=2$, show that $x=\frac{3}{4}\prod$ without using tables. (6 Marks)

c) Find the value of $\log_3\frac{1}{27}$ (4 Marks)