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| **FACULTY** | : | **ARTS & SCIENCES** |
| **DEPARTMENT** | : | **COMPUTER INFORMATION SYSTEMS** |
| **COURSE CODE** | : | **MATH 100** |
| **COURSE TITLE** | : | **BASIC MATHEMATICS** |
| **TIME** | : | **2HRS** |
| **MODE** | : | **PART-TIME TOWN CAMPUS** |

Instructions:     *Attempt Question 1 and any other two questions.*

**Question 1(30 Marks)**

a) Define the following terms:

     i)       Arithmetic progression

     ii)      Geometric progression                    (2 mks)

b) Solve for x in the given equation $2^{x-3} = 8^x$        (3 mks)

c) Compute the interest paid on a loan of Ksh 1400 at a 9% interest rate for 18 months.      (2 Mks)

d) Find the inverse of the matrix

$$\begin{bmatrix} 2 & 1 \\ 5 & 3 \end{bmatrix}$$

                                                     (3 mks)

e) Find the solution to the system using elimination method.

$$3x + 2y = 4$$
$$5x - y = 8$$

                                                     (3 mks)

f) Find a real number x which satisfies each of the following

     i) $81x = 3\sqrt{3}$                       (2 mks)

     ii) $\left(\frac{1}{32}\right)^x = 4$              (2 mks)

g) Without using tables, find each of the following

     i) $\log_2 64$                        (2 mks)

     ii) $\log_2 4\sqrt[3]{4}$                   (2 mks)

h) Given that

         $E = \{1, 2, 3, \ldots\ldots, 100\}$

         $A = \{5, 6, 7, \ldots\ldots, 21\}$

         $B = \{14, 15, 16, \ldots.35\}$

Taking E as the universal set, find the following:

i) $A \cap B$ (2 mks)

ii) $A \cup B$ (2 mks)

iii) $A' \cap B$

(2 mks)

i) A rectangle with a perimeter of 100m is to have an area of at least 500m². Within what bounds must the length of the rectangle lie? (3 mks)

## Question 2

a) Solve the following equations

i) $\dfrac{3y+2}{2y+1} - \dfrac{6y-9}{4y+3} = 0$ (3 mks)

ii) $\dfrac{x+1}{3} - \dfrac{x-2}{7} = 5$ (3 mks)

b) Solve the inequalities

i) $\dfrac{3x-4}{2x+1} < -2$ (3 mks)

ii) $2x^2 + 7x \leq 4$ (3 mks)

c) Given that $f(x) = \dfrac{x^2-1}{x^2+1}$ , $g(x) = \dfrac{1}{x}$

Find:

i) fog (x) (2 mks)

ii) gof (x) (2 mks)

b) If Ksh 800 is invested at 12% for 2 years, find the amount at the end of two years if the interest is compounded

    i. Annually

    ii. Semi annually

    iii. Quarterly (4 Mks)

## Question 3

a) A quadratic equation in $x$ is of the form

$ax^2 + bx + c = 0$

Why should $a \neq 0$ (2 mks)

b) Solve by

i) Factoring, $x^2 - 10x + 9 = 0$

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ii) Completing the square, $3x^2 - 4x - 5 = 0$

iii) Quadratic formula, $25x^2 + x + 1 = 0$         (6 mks)

c) Use elementary row operations to solve the following system

$2x + 3y + z = -1$

$3x + 3y + z = 1$         (8 mks)

$2x + 4y + z = -2$

d) Find the inverses of the matrices below

i) $\begin{pmatrix} 1 & 4 \\ -1 & -3 \end{pmatrix}$

ii) $\begin{pmatrix} 3/5 & 1/5 \\ -2/5 & 1/5 \end{pmatrix}$         (4 mks)

## Question 4

a) A salesperson's commission rate is 25%. He received a commission of Ksh 425 on the sale of a motorbike. How much did the motorbike cost?         (3 Mks)

b) A rug is marked at a price of Ksh 240 and is on sale at 25% off. What is the discount and sale price?

        (3 Mks)

c) i) Find the sum of the first 17 terms of the A.P 2½, 3¼, 4,……         (3 mks)

  ii) The first term of an AP is 5, the last is 19 and the sum is 84. Find the number of terms and the common difference.         (3 mks)

d) The 6th term of a GP is 27 and the common ratio $= 3$. Find the first term and the sum of the first 8 terms.         (4 mks)

e) Find the domain and range of each of the following functions:

i) $y = \dfrac{\sqrt{3x+2}}{x^2 + x - 6}$

ii) $f(x) = \sqrt{x^2 - x - 2}$         (4 mks)

## Question 5

a) If Kshs.800 is invested at 13% for 4 years. Find the amount at the end of four years, if the interest is compounded quarterly.         (3 mks)

b) The width of a rectangular swimming pool is one-third its length.  If its perimeter is 96 metres, find the dimensions of the pool.                                                                    (4 mks)

c) If Ksh 1700 is invested at 7.8% compounded quarterly, find the amount compounded at the end of 10 years.                                                                                                              (3 Mks)

d) A factory manufactures three types of balls at a monthly cost of $2,425 for 1,125 balls.  The manufacturing costs for the three types of balls are $4, $3 and $2 respectively.  These balls sell for $16, $12 and $10 respectively.  How many of each type are manufactured if the monthly profit is $9,275. (Profit = Income – cost).                                                                           (10 mks)