

Kenya Methodist University
End of Trimester Examinations, April 2007

FACULTY : **SCIENCE**
DEPARTMENT : **MATHEMATICS AND COMPUTER SCIENCE**
COURSE CODE : **MATH 100**
COURSE TITLE : **MATHEMATICS**
MODE : **SCHOOL-BASED**
TIME : **2 HRS**

Instructions:

- Answer Question ONE (compulsory) and ANY OTHER TWO questions.
- Show ALL your working.

QUESTION ONE (30 marks) – Compulsory:

1. Give the set of real numbers for whose elements the following expressions do not exist:

- a. $1/(x^2 - 3x + 2)$
b. $x/(3 - y)$ (3 marks)

2. Use the set former notation to express the following statements:

- a. $x \in [8, 27]$
b. $y \in (-9, 100) \wedge y \notin [0, 10]$ (2 marks)

3. Solve the following equations:

- a. $2x^2 + 9x + 7 = 3$
b. $9x^2 - 18x + 4 = 0$ (4 marks)

4. Given that $f(x) = x^2 - 3x + 1$ and $g(x) = (x-2)/(x^2+2x)$, determine $(f+g)(x)$ for $x=-4$ (3 marks)

5. Given $\log_{10} 2 = 0.301$ and $\log_{10} 3 = 0.477$, determine:

- a. $\text{Log}_{10} 81$
b. $\text{Log}_{10} 48$ (4 marks)

6. Determine the 10th term of an arithmetic progression whose initial term is -7 and the common difference is 15.7 (4 marks)

7. Find the product of the following matrices:

$$A = \begin{pmatrix} 3 & 3 & 0 \\ 5 & 4 & 2 \\ 3 & -1 & 6 \end{pmatrix} \quad B = \begin{pmatrix} 2 & 4 \\ -1 & 0 \\ 3 & -2 \end{pmatrix} \quad (3 \text{ marks})$$

8. Compute the total amount paid on a kshs. 50,000 loan, after two years, at 5% interest

- a. Compounded annually
b. Using simple interest (4 marks)

9. Wanjiru bought a new car at a cost of kshs. 600,000 from Dubai Traders Ltd. She paid kshs. 150,000 as down-payment, and agreed to pay the balance in 24 equal monthly installments, at a rate of 22% of the unpaid balance. Compute the amount payable as installment per month. (3 marks)

QUESTION TWO (15 marks)

1. Given $f(x) = x^3 - x + 1$ and $g(x) = (5 - 3x)/4$, determine:
- a. $f^{-1}(x)$ (2 marks)
 - b. $(g \circ f)(-7)$ (2 marks)
 - c. The domain of $(f \circ g)(x)$ (3 marks)
2. Given the set $A = \{x \in \mathfrak{R}^+ / x \text{ is a multiple of 3, and } x \text{ is even}\}$ and the set $B = \{x \in \mathfrak{R}^+ / x \text{ is an integer less than 100}\}$, list the elements of each of the following sets:
- a. $A \cap B$
 - b. $A \cup B$
 - c. $A - B$
 - d. $\sim A \cap B$ (8 marks)

QUESTION THREE (15 marks)

1. Solve the following inequality:
- $$\frac{x+7}{3x-4} < 5$$
- (3 marks)
2. Onyango invested Kshs 123,000 at a 6.4% interest, compounded every 4 months. Calculate the total interest earned on the investment at the end of the 7th year. (5 marks)
3. Find the inverse of the following matrix:
- $$A = \begin{pmatrix} 2 & -1 \\ 4 & -3 \end{pmatrix}$$
- (4 marks)
4. Find the matrix B such that:
- $$\begin{pmatrix} 1 & 4 & 7 \\ 3 & -1 & 5 \\ -2 & 0 & 8 \end{pmatrix} - B = \begin{pmatrix} 0 & -3 & 4 \\ 1 & 5 & 12 \\ 9 & 7 & 2 \end{pmatrix}$$
- (3 marks)

QUESTION FOUR (15 marks)

1. Use logarithms to solve the following problem
- $$\frac{(3.66 \times 5.26)^2}{10.71}$$
- (4 marks)
2. Write the characteristic and mantissa of the following logarithms
- a. 1.4683
 - b. -1.3925 (2 marks)
3. Consider a geometric progression whose initial term is 4, and the common ratio is -3:
- a. Find the 10th term in the progression.
 - b. Find the sum of the first four terms of the progression. (6 marks)
4. Solve the following equation for x:
- $$\frac{6x-4}{4x+2} = \frac{12x-18}{8x+6}$$
- (3 marks)