MINEDUC **CLASSES: S6 (MCB, PCM, MPC, MEG)**

KICUKIRO DISTRICT **MATHEMATICS.**

ECOLE SECONDAIRE KANOMBE/ EFOTEC.

SENIOR SIX HOLIDAY PACKAGE/

INSTRUCTIONS:

Attempt all questions in their respective order

Geometrical instruments and silent non-programmable calculators may be used.

Q1. Find the matrix X such that $2X + 3A = B$ if $A = \begin{pmatrix} -2 & -1 \\ 1 & 0 \\ 3 & -4 \end{pmatrix}$ $B = \begin{pmatrix} 0 & 3 \\ 2 & 0 \\ -4 & -1 \end{pmatrix}$ **/ 4marks**

Q2. The lengths of sides of a triangle are 7m, 10m and 16m. Calculate the size of each angle of the triangle. Give the answer correct to the nearest degree. **/ 4 marks**

Q3. You are given the system of equation: $\begin{cases} kx - 9y = -3 \\ 4x + (k-12)y = k \end{cases}$ Where k is a real number.

For which value of k does the system of equation have no solution? **/ 5 marks**

Q4. Find the distance between the point $A(4,2,-1)$ and the plane P whose equation is $3x - 4y + z + 6 = 0$ in Euclidian space $\mathbb{R}^3$. **/ 4 marks**

Q5. The following are percentages of milk fats from 20 samples collected from the milk brought by famers to a milk-collecting centre

4.12 4.04 3.96 3.95 3.98 3.94 3.98 4.12 3.98 3.96

3.95 4.02 3.95 4.02 4.04 3.98 4.02 4.02 3.95 4.02

Calculate the standard deviation of the data. **/ 4 marks**

Q6. Solve in $\mathbb{R}$ set the equation: $2\ln(x+1) = \ln(1-x)$ **/ 3 marks**

Q7. Show that the three points $A(2,-1,3), B(4,3,5), and\ C(6,7,7)$ are collinear. **/ 4 marks**

Q8. Calculate: $\int \frac{tanx}{secx+cosx}dx$ **/ 5marks**

Q9. Solve for x: $4^{5-9x} = \frac{1}{8^{x-2}}$ **/ 3 marks**

Q10. Two cars start out at the same point. One car start out driving north at $25km/h$. Two hours later, the second car starts driving east at $20km/h$. How long after the first car starts travelling does it take the two cars to be $300km$ apart? **/4 marks**

Q11. Given the matrix $A = \begin{pmatrix} 3 & 1 & -3 \\ 1 & 2a & 1 \\ 0 & 2 & a \end{pmatrix}$

find the possible values of a such that matrix A is singular. **/ 3marks**

Q12. Evaluate the limit: $\lim_{x\to -4} \frac{\ln(x+5)}{x+4}$ **/ 3 marks**

Q13. Solve: $z^2 - 2(cos\beta)z + 1 = 0$ **/ 2marks**

Q14. a) Determine whether the series (U_n) $n \in \mathbb{N}$ given by $U_n = \frac{2n+6}{8}$ is arithmetic or geometric. **/ 2 marks**

b) Calculate $\sum_{n=1}^{20} U_n$ **/ 2marks**

Q15. Utilising Moivre's theorem, express $sin5x$ as a polynomial in $sinx$. **/ 3mark**

Q16. A) The population(p) of Enzymes in a culture solution changes according to the equation:

$\frac{dp}{dt} = \frac{3000}{1+0.25t}$, where $t$is the time in hours. The initial population when $t = 0$ second is 1000.

i) Find the expression for the population (p). **/ 5marks**
ii) Find the number of enzymes after $t = 3$hours **/5marks**

B) Suppose that the profit p obtained in selling x units of certain item each week is given by:

$p = 50\sqrt{x} - 0.5x - 500$ where $0 \leq x \leq 8000$. Find the rate of change of p with respect to x

when$x = 1600$. **/ 5marks**

Q17. The function f is defined by $f(x) = \frac{\sqrt{1-x^2}}{x}$

a) Determine the domain of definition of the function$f$ and the limits of the boundaries of the domain. **/4marks**
b) Write the equations of asymptotes if available. **/ 1mark**
c) Determine the first derivative and the second derivative of the function f. **/ 5marks**
d) Determine the variation of the function f, the point of inflexion and the nature of the curve representing the function f. **/ 3marks**
e) Sketch the graph of the curve of the function f. **/ 2marks**

Q18. a) The events A, B and C in the same sample space are such that A and C are mutually exclusive events, while A and B are independent events. Given that $P(A) = \frac{2}{3}, P(C) = \frac{1}{5}, P(A \cup B) = \frac{4}{5}$ and$P(B \cup C) = \frac{13}{25}$. Find: $P(A \cup C)$, $P(B)$, $P(A \cap B)$ **/ 6marks**

b) Prove that $\sqrt{2 + \sqrt{2 + \sqrt{2 + 2cos8x}}} = 2cosx$ **/ 4marks**

c) Solve the equation $\left(x + \sqrt{x}\right)^4 - \left(x + \sqrt{x}\right)^2 = 159600$ **/ 5marks**

Q19. a) Consider $F = \{(x, 0, z), x, z \in \mathbb{R}\}$ and $G = \{(x, y, 0), x, y \epsilon \mathbb{R}\}$

Find: i) Dim F ii) Dim G iii) Dim (F+G) **/6marks**

b) Verify Grassmann's formula. **/ 4marks**

c) Consider F=$\{(x, 0, z), x, z \in \mathbb{R}\}$ and $G = \{(x, y, 0), x, y \epsilon \mathbb{R}\}$. Find $F \cap G$ **/ 5marks**

Q20. a) Solve the following system of equations using the Gauss Jordan elimination method.

$$\begin{cases} 2x + y - 3z = 2 \\ x - 2y + z = 3 \\ 3x - y - 3z = 3 \end{cases}$$

/ 8marks **b)** Solve: $y'' - y' - 2y = sin2x$ **/ 7marks**

!!!!!!!!!!!!!!!!!END!!!!!!!!!!!!