**P425/1**
**PURE MATHEMATICS**
**Paper 1**
**July/August**
**3 Hours**

# ELITE EXAMINATION BUREAU MOCK 2019

**Uganda Advanced Certificate of Education**

PURE MATHEMATICS

**PAPER 1**

**3 Hours**

## INSTRUCTIONS TO CANDIDATES

- *Attempt all the **eight** questions in section **A** and any**five** from section **B**.*
- *All working must be clearly shown.*
- *Mathematical tables with a list of formulae and squared paper are provided.*
- *Silent, simple non programmable scientific calculators and a list of formulae may be used.*
- *State the degree of accuracy at the end of each answer using **CAL** for calculator and **TAB** for tables.*

Turn Over

**SECTION A (40 Marks)**
**Attempt ALL questions in this section.**

1. Solve the inequality $\frac{1+x}{4+x} \geq \frac{5-2x}{x}$ (5marks)

2. Evaluate $\int_3^4 \frac{1}{x^2-3x+2}\,dx$ (5marks)

3. Solve the equation $2tan\theta + sin2\theta sec\theta = 1 + sec\theta$ for $0 \leq \theta \leq 2\pi$. (5marks)

4. The line $5x-2y+8=0$ is a tangent to the circle with centre at $(-2,3)$. Find the equation of the circle. (5marks)

5. Expand $(25-2x)^{\frac{1}{2}}$ in ascending powers of $x$ up to the term in $x^3$. Hence by taking x=1, obtain the value of $\sqrt{23}$ correct to four significant figures. (5marks)

6. If $y = e^{2x}sin2x$, show that $\frac{d^2y}{dx^2} = 8(2e^{2x}cos^2x - 1)$. (5marks)

7. The position vectors of the points P and Q are $3\underline{i} - \underline{j} + 2\underline{k}$ and $2\underline{i} + 2\underline{j} + 3\underline{k}$ respectively. Find the acute angle between PQ and the line;
$1 - x = \frac{y-3}{2} = \frac{4-x}{2}$ (5marks)

8. Solve the differential equation, $\left(\frac{dy}{dx}\right)^3 = e^{(x-3y)}$. Given that y (6) = 0. (5marks)

**SECTION B (60MARKS)**
**Attempt ONLY 5 questions in this section.**

9. a) Show that;
$\log_{16}(xy) = \frac{1}{2}\log_4 x + \frac{1}{2}\log_4 y$. Hence or otherwise, solve the simultaneous equations.
$\log_{16}(xy) = \frac{7}{2}$

$\log_4 x / \log_4 y = -8$ (7marks)

b) Solve the equation $2^{(2+2x)} + 3.2^x - 1 = 0$. (5marks)

10. a) Find x, if $\sin^{-1}x + cos^{-1}\left(\frac{x}{2}\right) = \frac{5\bar{\lambda}}{6}$. (5marks)

b) Express $5sin\emptyset + 12cos\emptyset$ in the form $r\,sin(\emptyset + a)$,giving the value of r and a, hence find $5sin\emptyset + 12cos\emptyset = 7$. (7marrks)

11. a) Differentiate with respect to x.
i) $x^{\log_{10} x}$
ii) $tan^{-1}\left(\frac{1-x}{1+x}\right)$, simplify your answers (8marks)
b) if $y = e^{4x}cos3x$, show that $\frac{d^2y}{dx^2} - 8\frac{dy}{dx} + 25y = 0$. (4marks)

12. a) Show that the line $\frac{x-2}{2} = \frac{y-2}{-1} = \frac{z-3}{3}$ and the plane $\underline{r}.\begin{pmatrix} 4 \\ -1 \\ -3 \end{pmatrix} = 4$ are parallel and find the perpendicular distance of the line from the plane. (6marks)

b) Find the equation of the plane passing through the origin and parallel to the lines'
$\frac{x+2}{3} = \frac{y-1}{4} = \frac{z+1}{5}$ and $\frac{x-3}{4} = \frac{y-2}{-5} = \frac{z+1}{1}$. (6marks)

13. a) Solve the differential equation
$x^2\frac{dy}{dx} = y(y+x)$; Given that $y(4) = 6$. (4marks)

b) A certain game park was found to have 100 lions. Given that the lions die at a rate proportional to the number of lions present and the initial death rate is 5 lions per year.
i) Form a differential equation and solve it.
ii) How many lions will be in the park after six years? (8marks)

14. a) Given that $Z = \cos\emptyset + isin\emptyset$, where $\emptyset \neq \pi$, show that $\frac{2}{1+z} = 1 - i\,tan\left(\frac{1}{2}\emptyset\right)$. (6marks)

b) The polynomial $P(z) = z^4 - 3z^3 + 7z^2 + 21z - 26$ has $2 + 3i$ as one of the roots. Find the other three roots of the equation $P(z) = 0$. (6marks)

15. a) Work out $\int \frac{dx}{e^x - 1}$. (5marks)
b) The area bounded by the curve $y = x(x-4)$, and the x-axis is rotated about the x-axis through a ½ -turn. Find the volume of the solid generated. (7marks)

16. a) find an equation of the circle that passes through the points. $A(-1,4), B(2,5)\ and\ C(0,1)$. (5marks)
b) The line $x + y = c$ is a tangent to the circle $x^2 + y^2 - 4y + 2 = 0$. Find the coordinates of the points of contact of the tangent for each value of C. (7marks)

**END**