**P425/1**
**PURE MATHEMATICS**
Paper 1
**March.2025**
3 hours

# BUKONDE SECONDARY SCHOOL

***Uganda Advanced Certificate of Education***

**TEST 2 (TWO)**

PURE MATHEMATICS

**Paper 1**

3 hours

## INSTRUCTIONS TO CANDIDATES;

This paper consists of two sections; **A** and **B**

Section **A** is compulsory.

Answer only five questions from section B.

Any additional question(s) answered will not be marked.

**All** necessary working **must** be shown clearly.

Begin each answer on a fresh page.

Graph paper is provided.

*Silent, non-programmable scientific calculators and mathematical tables with list formulae may be used.*

## SECTION A (40 MARKS)

*Answer* **all** *the questions in this section*.

**1**. Solve the equation $log_2^x - log_x^8 = 2$. (05 marks)

**2**. Prove the identity $\frac{\sec\theta\sin\theta}{\tan\theta+\cot\theta} = sin^2\theta$. (05 marks)

**3**. If $y = e^{\tan^{-1}x}$, Show that $(1+x^2)\frac{d^2y}{dx^2} + (2x-1)\frac{dy}{dx} = 0$.

(05 marks)

**4**. Find the perpendicular distance of a point P(3,1,7) from the line $r = 3i + j - 2k + \lambda(2i - j + 2k)$. (05 marks)

**5**. Calculate the total area bounded by the curve $y = 3x^2 - 6x$, the $x - axis$ and the lines $x = -1$ and $x = 2$. (05 marks)

**6**. Find the possible values of $k$ if the quadratic equation $2kx^2 - 8x + 1 = 2k(x-2)$ has equal roots.

(05 marks)

**7**. Using maclaurin's theorem, expand $y = x + \ln(1+x)$ as far as the term in $x^3$. (05 marks)

**8**. Determine the equation of the circle with centre at (1,5) and has a tangent passing through the points A(-1,2) and B(0,-2). (05 marks)

## SECTION B (60 MARKS)

*Answer any* **five** *questions from this section*

**9**. (a) Solve the equation $5\sin\theta - \cos 2\theta + 3 = 0$ for values of $\theta$ in the range $0° \leq \theta \leq 360°$. (05 marks)

(b) Given that $\cos A = \frac{-8}{17}$ and $\tan B = \frac{5}{11}$ where A is a $reflex\ angle$ and B is an $acute\ angle$. Without using tables or calculator, find the value of $4\sin A + 5\sin B$. to three significant figures. (07 marks)

**10**. (a) Given that:

$$f(x) = 2x^3 - 3x^2 - 11x + 6, \text{ and } f(3) = 0$$

$factorise\ f(x)$. (05 marks)

(b) Show that $\sqrt{\frac{1+2x}{1-x}} = 1 + \frac{2}{3}x + \frac{3}{8}x^2 + \cdots$ ... ... .... By substituting $x = 0.02$, deduce the value of $\sqrt{13}$ to 3 significant figures.

(07 marks)

**11**. The curve is given parametrically by the equation $x = \frac{t}{1+t}$ and $y = \frac{t^2}{1+t}$

(a) Find the Cartesian equation of the curve. (02 marks)

(b) Determine the turning points of the curve. (04 marks)

(c) Sketch the curve. (04 marks)

**12**. (a) Use the mathematics of small changes to evaluate $\sin 29.5°$ to 4dps. (05 marks)

(b) A right circular cone has a slant length of $9\sqrt{3}$cm. calculate the maximum volume of the cone: and state the corresponding values of the height and radius in this case.

(07 marks)

**13**. Given that $r_1 = \begin{pmatrix} 6 \\ -1 \\ 2 \end{pmatrix} + \lambda \begin{pmatrix} 3 \\ -2 \\ -1 \end{pmatrix}$ and $r_2 = \begin{pmatrix} 7 \\ 3 \\ -3 \end{pmatrix} + \mu \begin{pmatrix} 2 \\ 1 \\ -3 \end{pmatrix}$

(a) Find the coordinates of their point of intersection. (04 marks)

(b) Calculate the acute angle between the lines. (04 marks)

(c) Find the Cartesian equation of the plane containing the lines.

(04 marks)

**14**. (a) Given that $Z_1 = \frac{7-i}{3-4i}$,

Express $Z_1$ in the form $a + bi$. Hence or otherwise express $Z_1$ in polar form. (05 marks)

(b) Find the equation of the locus $|Z + Z_1 - 2| = 3$, given that $Z = x + iy$, hence Sketch the locus above. (07 marks)

**15**. (a) If $y = \sin^{-1}\left(\frac{x}{\sqrt{1+x^2}}\right)$, Show that $\frac{dy}{dx} = \frac{1}{1+x^2}$ (05 marks)

(b) Evaluate $\int \frac{x^2+2x-2}{(x^2+2)(x+1)}dx$ (07 marks)

**16**. (a) Find the length of the tangent from (5,7) to the circle

$x^2 + y^2 - 4x - 6y + 9 = 0$ . (05 marks)

(b) A circle touches both x-axis and the line $4x - 3y + 4 = 0$. Its centre is in the first quadrant and lies on the line $x - y - 1 = 0$. Prove that its equation is $x^2 + y^2 - 6x - 4y + 9 = 0$.

(07 marks)

**END**