P425/1
PURE MATHEMATICS
AUGUST - 2025
3 HOURS

JINJA JOINT EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

MOCK EXAMINATIONS – AUGUST, 2025

PURE MATHEMATICS

Paper 1

3 HOURS

INSTRUCTIONS TO CANDIDATES

*Answer **all the eight** questions in section **A** and any **five** from section **B**.*

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

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

Begin each question on a fresh sheet of paper.

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

 Turn Over

SECTION A: (40MARKS)

Attempt all questions in this section

1. The sum of the first n-terms of the series $3 + 8 + 15 + \cdots + (n^2 + 2n)$ is $\frac{125}{3}n$. Find the value of n. ***(5 marks)***
2. Solve $cot^2 2\theta + 3cosec^2 2\theta = 7$ for $0^0 \leq \theta \leq 180^0$. ***(5 marks)***
3. A variable line through the point (2, -5) cuts the axes at L and M, and the perpendiculars to the axes at L and M meet at P. What is the locus of P? ***(5 marks)***
4. Find $\frac{dy}{dx}$ if; $y = tan^{-1}\left(\frac{6x}{1-2x^2}\right)$. ***(5 marks)***
5. Find $\int \frac{2x}{cos^2(x^2+3)}\, dx$. ***(5 marks)***
6. Given that A(2, 1, 5) and B(3, -1, 7) are points on a straight line which meets the plane $4x + 3y - 2z + 17 = 0$ at point T. Find the coordinates of T. ***(5 marks)***
7. Find the value of x if $log_{x^2}27 - log_x 81 - \frac{1}{2} = 0$. ***(5 marks)***
8. A wire of length 200m is to be cut into two pieces. One piece folded to form a circular ring and the other to form a rectangle whose length is twice its width. Show that for maximum total area, the circumference of the circle is approximately 82m. ***(5 marks)***

SECTION B:

Answer any five questions

9. (a.) Solve for x if, $4(25^x) + 7(5^x) - 2 = 0$. ***(5 marks)***

   (b.) Express $3x^3 - 7x^2 + 5x - 11$ in the form $(x^2 - 3x - 4)Q(x) + Ax + B$, Where $Q(x)$ is a polynomial in x and A and B are constants. Determine the values of A and B and the expression $Q(x)$. ***(7 marks)***

10. (a.) Prove that $\sin x - \sin(x + 60^0) + \sin(x + 120^0) = 0$. ***(4 marks)***

    (b.) Solve $3\cos\theta + 2\sin\theta = 2.5$, for $-180^0 \leq \theta \leq 180^0$. ***(4 marks)***

    (c.) Certain roads in a city form a triangle and are of lengths 100m, 110m and 150m. Find the difference between the largest angle and the right angle. ***(4 marks)***

11. (a.) Differentiate with respect to x.

    (i.) $y = e^{4x}\cos 3x$.

    (ii.) $y = \frac{(2-x)^2(1+x)}{(4+x)^3}$. ***(6 marks)*** (b.) Given the parametric equations $x = 3 - 7\cos\theta$ and $y = 6 + 5sin^3\theta$. Find $\frac{d^2y}{dx^2}$ in terms of θ. *(6 marks)*

12. Given the points R(6, 1, 7), S(11, 0, 10) , T(-14, 5, -5) and N(3, 45, -20) ;

(a.) Show that;

(i.) points R, S and T are collinear.

(ii.) STN is a right angle. *(6 marks)*

(b.) Find the cartesian equation of the plane containing points R, S and N. *(6 marks)*

13. (a.) Find (i.) $\int xsec^2x\ dx.$

(ii.) $\int \frac{x^3}{\sqrt{1-x^2}}\ dx.$ *(7 marks)*

(b.) Evaluate $\int_3^5 \frac{2x^2+10}{(x-2)(x+1)^2}\ dx$ *(5 marks)*

14. (a.) Find the equation of a circle whose centre is (-3, 7) and touches the line $5x + 12y - 4 = 0.$ *(4 marks)*

(b.) Show that the circles $x^2 + y^2 + 8x - 20y - 28 = 0$ and $x^2 + y^2 - 2x + 4y - 20 = 0$ are orthogonal. *(8 marks)*

15. (a.) Find the square root of the complex number $24 + 10i.$ *(5 marks)*

(b.) If $\left|\frac{z-2i}{z+3}\right| = 2$, show that the locus of z a circle. *(5 marks)*

(c.) If $Z = -2 + 5i$, find the argument of Z. *(2 marks)*

16. (a.) The curve has gradient of $2x - \frac{y}{x}$ and it passes through point (3, -1). Find the equation of the curve. *(6 marks)*

(b.) Solve the differential equation $x^2\frac{dy}{dx} + y = x^2e^{\frac{1}{x}}$, given that $y = 2$ when $x = 1.$ *(6 marks)*