Pure Mathematics
Paper 1
12th November 2024
3 Hours

HOLY CROSS LAKE VIEW SECONDARY SCHOOL

UGANDA ADVANCED CERTIFICATE OF EDUCATION

S.5 END OF YEAR 2024

Pure Mathematics

Paper 1

3 Hours

INSTRUCTIONS TO CANDIDATES

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

*Any addition question(s) answered will **not** be marked*

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

Begin each answer on a fresh sheet of paper

Silent, non – programmable scientific calculators and mathematical tables with a list of

formulae may be used.

SECTION A: (40 marks)

Answer **all** questions in this section.

1. Find the equation of the normal to the curve

$$2y^2 - 5xy - 4x + 20 = 0 \text{ at point } (2,3).$$ **(5 marks)**

2. The roots of the quadratic equation $4x^2 - 5x + 7 = 0$ are α and β. Find the

   equation with integral coefficients whose roots are $\alpha - 2\beta$ and $\beta - 2\alpha$.

   (5 marks)

3. Solve the inequality $x \leq \dfrac{3}{x+2}$ **(5 marks)**

4. If a polynomial $P(x) = 2x^3 + Ax^2 + 4x + B$ is divided by $(x+1)^2$, find the values

   of A and B **(5 marks)**

5. Find the angle between the vectors $a = 2i - 4k$ and $b = 3i - 4j - 2k$.
   (5 marks)

6. Solve the equation $\cos 2\theta + \sin\theta = 0$ for $0^0 \leq \theta \leq 360^0$. **(5 marks)**

7. Find the locus of the point P, whose distance from the point $A(-1,2)$ is three

   times the distance from the origin. **(5 marks)**

8. Use small changes to approximate $\tan(44.4^0)$. leave π in your answer.

   (5 marks)

9. Expand $\sqrt{\frac{1+5x}{1-5x}}$ up to including term in x^2 and state the validity of the expansion.

Hence by putting $x = \frac{1}{50}$, evaluate $\sqrt{11}$ to three decimal places   *(12 marks)*

10. (a.) The point $C(-5, \alpha, \mu)$ lies on the line through points $A(4, -3, 1)$ and

   $B(7, 2, -1)$. Find the values of α and μ .   *(6 marks)*

   (b) Given that $a = 3i + 7j - 5k$, $b = 2i + 6j + 3k$ and
   $c = 4i - 8j - 2k$, Find the value of $|a.(b + c)|$ *(6 marks)*

11. (a) find the square root of $13 - 4\sqrt{10}$ leaving your answer in surd form. *(4 marks)*

   (b) Given the geometric series $16 + 24 + 36 + - - -$. Find the sum of the first 17

   terms.   *(4 marks)*

   (c) The prices of three items are in a geometric progression. If the total cost of the

three items is shs. 168,000 and the most expensive item priced at shs. 96,000. Find the

price of the other two items.   *(4 marks)*

12. (a) describe the locus $|Z + 1 - i| = 2|Z + i|$.   *(6 marks)*

   (b) Determine the $\sqrt[4]{\left(10 - 10i\sqrt{3}\right)^3}$ to three significant figures.   *(6 marks)*

13. (a) Given that $y = e^{-x}\sin(x + \alpha)$. Show that $\dfrac{d^2y}{dx^2} + 2\dfrac{dy}{dx} + 2y = 0$ (*5 marks*)

(b) If $x = \sec\theta$ and $y = \tan\theta$. Prove that;

(i) $\dfrac{dy}{dx} = \mathit{cosec}\,\theta$ and (ii) $y^3\dfrac{d^2y}{dx^2} + 1 = 0$ (*7 marks*)

14. Sketch the curve $y = 4x^3 - x^4$. Hence determine the area enclosed by the curve and

the $x - axis$ (*12 marks*)

15. Express $y = 15\cos2x - 20\sin2x$ in the form $R\sin(2x + \alpha)$. Hence determine

the maximum and minimum values of the expressions $\dfrac{5}{50 + 15\cos2x - 20\sin2x}$, in each

case state the smallest positive angle for which the values occur.

(*12 marks*)

16. Given the parametric equations $x = \dfrac{7t-3}{t+3}$ and $y = \dfrac{5t+5}{t+4}$. Determine $\dfrac{d^2y}{dx^2}$ in its simplest

form (*12 marks*)

The end.

Wishing you an exultant Yuletide, auspicious New year 2025, and exhorting relentless

erudition for optimal fruition.