OKWANG SECONDARY SCHOOL P.O.BOX 741, LIRA

S.5 END OF YEAR EXAMINATIONS 2024
P425/1 Pure Mathematics Paper 1
Time: 3 Hours

INSTRUCTIONS:

- Answer all the eight questions in Section A and only five questions in Section B. Each number in section B should start on a fresh page

## SECTION A (40 MARKS)

Qn 1: Evaluate $\frac{dy}{dx}$ $at\ x = 2$, given that $y = In\left[\frac{1+x^2}{1-x^2}\right]^{\frac{1}{2}}$ [5marks]

Qn 2: Solve the inequality: $|x-2| > |2x+1|$ [5marks]

Qn 3: Differentiate $y = \mathbf{4x^2} + 6x$ from first principles. [5marks]

Qn 4: Solve the equation $\sqrt{6x+1} - \sqrt{2x-4} = 3$ [5marks]

Qn 5: Solve for $x$, $\sin(x + 30\ ) = \cos x$, where $0 \leq x \leq 2\pi$. [5marks]

Qn 6: Show that $tan(\alpha + \beta) = 1, if\ tan\ \alpha = \frac{a}{a+1}$ $and\ tan\ \beta = \frac{1}{2a+1}$ [5marks]

Qn 7: Find the equation of the line which passes through the point (3, 2) and the point of intersection of the lines $3x - 4y - 6 = 0\ and\ 2x + 3y - 1 = 0$ .

$a-(x+b)^2$ [5marks]

Qn 8: Express the function $f(x) = 1 - 6x - x^2$ in form $f(x) = 1 - 6x - x^2$, hence state max of f(x) and the value of $x$ at which it occurs [5marks]

## SECTION B (60 MARKS)

**Question 9:**

(a). Solve the simultaneous equations

$$(x + 3)(y + 3) = 10\ and\ (x + 3)(x + y) = 2$$ [05marks]

(b). Use a substitution $y = x + \frac{2}{x}$ to solve, $x^4 - 5x^3 + 10x^2 - 10x + 4 = 0$

[07marks]

**Question 10:**

a) Express; $\sqrt{5}cosx + 2sinx$ in the form $Rcos(x - \alpha)$ where $R > 0$ and $0 < \alpha < 90°$.
Hence state the maximum value and minimum value of $\sqrt{5}cosx + 2sinx + 10$.

[06 marks]

b) Given that $acos^{2}\theta + bsin^{2}\theta = c$, prove that $tan^{2}\theta = \frac{c-a}{b-c}$ hence solve for $\theta$, in the equation $6cos^2\theta + 2sin^2\theta = 5$, *where* $\theta$ *is acute.* [06marks]

**Question 11:**

(a). In an AP, the thirteenth term is 27, and the seventh term is three times the second term. Find the first term, common difference and the sum of the first ten terms.
[06marks]

(b). The first, second and third terms of geometric progression (G.P) are $2k + 6$, $2k$ *and* $k + 2$ respectively, where k is a positive constant. Determine the;
i) value of k and the common ratio ii) the sum to infinity of the progression.
[06marks]

**Question 12:**

(a) The polynomial $f(x) = ax^3 + 3x^2 + bx - 3$ is exactly divisible by $(2x + 3)$ and leaves a remainder $-3$ when divided by $(x + 2)$. Find the values of $a$ *and* $b$.
[05marks

(b). The curve is given parametrically by the equations $x = \frac{t^2}{1+t^2}$, $y = \frac{t^3}{1+t^3}$,
show that $\frac{dy}{dx} = \frac{3t}{2-t^3}$ and that $\frac{d^2y}{dx^2} = 48$ at a point $\left(\frac{1}{2}, \frac{1}{2}\right)$ [07marks]

**Question 13:**

(a). Differentiate the following with respect to x.

(i). $(2x + 1)^3 In\sqrt{(x - 3)}$

(ii). $\frac{2x^2-3x}{(x+4)^2}$ [06marks]

(b). Find the equation of the normal to the curve $xy^3 - 2x^2y^2 + x^4 - 1 = 0$ at the point $(1, 2)$ [06marks]

**Question 14.**

a) Given that in the equation $ax^2 + bx + c = 0$ one of the roots of the equation is 3 times the other. Show that $3b^2 = 16ac$. [04marks]

b) Find the values of $\beta$ for which the equation $10x^2 + 4x + 1 = 2\beta x(2 - x)$ has equal roots [05marks]

c) Use synthetic approach to obtain the remainder when $(x + 4)$ divides the polynomial $2x^4 + 6x^3 - 7x^2 + 9x + 11$ [03marks]

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