UGANDA ADVANCED CERTIFICATE OF EDUCATION

SENIOR SIX

PURE MATHEMATICS

P425/ 1

JANUARY 2023

TIME: 3 HOURS

Instructions;

- Attempt all the eight questions in Section A and five from section B
- All working must be clearly shown
- Clearly indicate the questions attempted
- Silent non programmable calculators may be used

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SECTION A (40 marks)

1. Solve: $2\cos 2\theta - 5\sin 2\theta = 4$ for $0 \leq \Theta \leq \pi$ (5 marks)

2. Solve the equations;

$$x^2 - 10x + y^2 = 25$$

$$x - y + 1 = 0$$

(5 marks)

3. Find the equation of a normal of (2,1) to the curve (5 marks)
$y^2 + 3xy = 2x^2 - 1$

4. Solve for x in; $\log_a(x+3) + \frac{1}{\log_a x} = 2\log_a 2$ (5 marks)

5. Differentiate; $y = \sqrt{\frac{x^3}{x^2-1}}$ (5 marks)

6. Express $3\cos x - 4\sin x$ in the form $Rcos(x+\alpha)$ hence solve $3cosx - 4sinx = 2$ for $0 \leq \theta \leq 180$ (5 marks)

7. A triangle ABC has vertices at A (-4,10), B(2,2) and C(5,8). D is the midpoint of AB. The line through D parallel to AC meets BC at E. find the coordinates of the point E.

(5 marks)

8. Given that $y = \frac{2}{x^2}$. Find $\frac{dy}{dx}$ from first principles.

SECTION B

9. a) Given that **z** = $\frac{(3+4i)(2-3i)}{-i+3}$

i) express z in terms of a+bi (4 marks)

ii) find the argument of z (2 marks)

b) Solve $(2+i)z^2 - z + (2-i) = 0$

10. a) Given that $sinA = \frac{4}{5}$ and $sinB = \frac{5}{13}$ where both A and B are acute angles. Find the value of;

i) cot (A+B)

ii) sin(A-B) (6 marks)

b) Use $t = \tan\frac{x}{2}$; to solve $3sinx + 4cosx = 2$ for $-360 \leq x \leq 360$ (6 marks)

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11. a) Find the equation of the line through the intersection of the lines $3x - 4y + 6 = 0 \; and \; 5x + y + 13 = 0$ which;
    i) passes through the point (2,4)
    ii) makes an angle of 60 with the x-axis (6 marks)

    b) Show that the lines $3x - 2y + 1 = 0, x + 2y + 3 = 0 \; and \; 7x - 2y + 5 = 0$ pass through the same point

12. a) show that the curve $y = 5x(2 - x)$ (8 marks)
    b) Find $\frac{d^2y}{dx^2}$ given that $y = 5x - \frac{3}{\sqrt{x}}$ (4 marks)
13. a) differentiate the following with respect to x
    i) $(x + 1)^{1/2}(x + 2)^2$
    ii) $\frac{2x^2+3x}{(x-4)^2}$ (7 marks)
    b) Find the equation of a line through the point (2,3) and perpendicular to the line $x + 2y + 5 = 0$ (5 marks)
14. a) solve the equation
    $8cos^4x - 10cos^2x + 3 = 0 \; for \; x \; in \; the \; range \; 0^0 \leq x \leq 360$ (6 marks)
    b) Given that $Sin(A + 30^0) = Cos(x + 30^0)$. Find the value of tan x (6 marks)
15. a) without using tables or calculators;
    Find the value of;

$$\frac{(\sqrt{5} - 2)^2 - (\sqrt{5} + 2)^2}{8\sqrt{5}}$$

    b) Solve the simultaneous equations.

$$\begin{aligned} 2a - 3b + c &= 10 \\ a + 4b + 2c + 3 &= 0 \\ 5a - 2b - c &= 7 \end{aligned}$$

(6 marks)

GOOD LUCK

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