

UGANDA ADVANCED CERTIFICATE OF EDUCATION

SENIOR SIX

PURE MATHEMATICS

P425/ 1

MID - 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.

**SECTION A (40 marks)**

1. Given that the equation  $2x^2 + 5x - 8 = 0$  has roots  $\alpha$  and  $\beta$  ;  
find the equation whose roots are  $\frac{1}{(\alpha+2)^2}$  and  $\frac{1}{(\beta+2)^2}$  (5 marks)

2. The vector equations of two lines  $r_1$  and  $r_2$  meet at a point P.

$$r_1 = \begin{pmatrix} 5 \\ -6 \end{pmatrix} + \theta \begin{pmatrix} 3 \\ 1 \end{pmatrix} \text{ And}$$

$$r_2 = \begin{pmatrix} 4 \\ 1 \end{pmatrix} + \mu \begin{pmatrix} -2 \\ 3 \end{pmatrix} \text{ Find the coordinates of point P.}$$

3. Solve the equation  $\cos(\theta + 30^\circ) = \sin(\theta + 25^\circ)$  for  $0^\circ \leq \theta \leq 360^\circ$

4. Solve for x in;  $\log_4(6 - x) = \log_2 x$  (5 marks)

5. A curve is defined parametrically by

$$x = t^2 - t$$

$$y = 3t + 4$$

Find the equation of the tangent to the curve at (2,10)  
(5 marks)

6. If  $y = \sqrt{x}$ . Show that  $\frac{\partial y}{\partial x} = \frac{1}{\sqrt{(x+dx)} + \sqrt{x}}$  hence deduce  $\frac{dy}{dx}$

7. Solve the equation  $\sqrt{(2x + 3)} - \sqrt{(x + 1)} = \sqrt{(x - 2)}$   
(5 marks)

8. Find the equation of the line through the point (5,3) and is perpendicular to the line  $2x - y + 4 = 0$

### SECTION B

9. a) Given that  $x = \frac{3t}{t+3}$  and  $y = \frac{4t+1}{t-2}$

Find  $\frac{d^2y}{dx^2}$  in terms of  $t$  in its simplest form

b) Differentiate  $\frac{(x^2+1)}{(x+1)^3}$  with respect to  $x$

10. sketch the curve  $y = \frac{4(x-3)}{(x+1)^3}$  (12 marks)

11. a) The polynomial  $f(x) = x^3 + px^2 - 5x + q$  has a factor  $(x-2)$  and has a value of 5 when  $x=-3$ . Find  $P$  and  $q$

b) The roots of the equation  $ax^2 + bx + c = 0$  are  $\alpha$  and  $\beta$ . Form the equation whose roots are  $\alpha/\beta$  and  $\beta/\alpha$

c) Simplify  $\frac{\sqrt{3}-2}{2\sqrt{3}+3}$

12. solve :

a)  $4\sin^2\theta - 12\sin\theta + 35\cos^2\theta = 0$  for  $0 \leq \theta \leq 90^\circ$  (06 marks)

b)  $3\cos\theta - 2\sin\theta = 2$  for  $0^\circ \leq \theta \leq 360^\circ$  (06 marks)

13. solve the equation:  $2(3^{2x}) - 5(3^x) + 2 = 0$  (06 marks)

b) The equations of three planes  $p_1, p_2$  and  $p_3$  are

$$2x - y + 3z = 3$$

$$3x + y + 2z = 7$$

$$x + 7y - 5z = 13$$

Determine where the three planes intersect. (06 marks)

14. Show that ;

$$\frac{\sin 3\theta \sin 6\theta + \sin \theta \sin 2\theta}{\sin 3\theta \cos 6\theta + \sin \theta \cos 2\theta} = \tan 5\theta$$

b) Solve;  $4\cos\theta - 5\sin\theta = 2.2$  for  $0^\circ \leq \theta \leq 360^\circ$

15. a) express  $\frac{i}{4+6i}$  in modulus argument form

b) Solve  $(z + 2z^*)z = 5 + 2z$  where  $z^*$  is the complex conjugate of  $z$

**\*GOOD LUCK\***