

P425/1  
**PURE MATHEMATICS**  
PAPER 1  
3 HOURS

**UGANDA ADVANCED CERTIFICATE OF EDUCATION**

**POST MOCK SET 6 2020**

**PURE MATHEMATICS**

Paper 1

3 hours

**INSTRUCTIONS TO CANDIDATES:**

- Attempt **ALL** the **EIGHT** questions in section **A** and any **FIVE** from section **B**.
- All working must be clearly shown.
- Mathematical tables with list of formulae and squared paper are provided.
- Silent, non-programmable calculators should be used.
- State the degree of accuracy at the end of each answer using **CAL** for calculator and **TAB** for tables.
- Clearly indicate the questions you have attempted in a grid on your answer scripts.

Question		Mark
Section A		
Section B		
<b>Total</b>		

**SECTION A (40 marks)**

*(Answer all questions in this section)*

1. Solve for  $x$ , in the equation  $9^{x-1} - 3^{x+2} + 162 = 0$ . **(5 marks)**
  
2. The lines  $4x - 3y = 5$  and  $y = 3$  are tangents to two circles whose centres lie on the line  $x = 7$ . Find the distance between the centres of the circles. **(5 marks)**
  
3. Solve  $\sec^2(2\theta) - 3\tan 2\theta + 1 = 0$ , for  $0^\circ \leq \theta \leq 180^\circ$  **(5 marks)**
  
4. The ages of a mother and her three children are in a geometrical progression, the sum of their ages is 195 years and the sum of the ages of the two young children is 60 years. Find the age of the mother. **(5 marks)**
  
5. Evaluate  $\int_3^5 \frac{2(x+1)}{2x^2-3x+1} dx$ . **(5 marks)**
  
6. The equation of the normal to the curve  $xy^2 + 3y^2 - x^3 + 5y - 2 = 0$  at the point  $(a, -2)$  is  $15x - 8y - 46 = 0$ . Find the value of  $a$ . **(5 marks)**
  
7. Find  $\frac{dy}{dx}$  if  $y = x \sin^2 x$ . when  $x = \frac{\pi}{4}$  **(5 marks)**
  
8. Find the Cartesian equation of a plane containing point  $(1, 3, -4)$  and the line  $\frac{x-1}{2} = \frac{y+2}{3} = z$ . **(5 marks)**

## SECTION B (60 marks)

(Answer any **five** questions from this section. All questions carry equal marks)

9. (a.) Given that  $2A + B = 135$  show that  $\tan B = \frac{\tan^2 A - 2\tan A - 1}{1 - 2\tan A - \tan^2 A}$ . **(4 marks)**
- (b.) If  $\alpha$  is an acute angle and  $\tan \alpha = \frac{4}{3}$ , show that  $4 \sin(\theta + \alpha) + 3 \cos(\theta + \alpha) = 5 \cos \theta$ . Hence solve for  $\theta$  the equation  $4 \sin(\theta + \alpha) + 3 \cos(\theta + \alpha) = \frac{\sqrt{300}}{4}$  for  $-180^\circ \leq \theta \leq 180^\circ$ . **(8 marks)**
10. (a.) Show that  $y = x - 3$  is a tangent to the curve  $y = x^2 - 5x + 6$ . **(3 marks)**
- (b.) A chord to the parabola  $4x - 3y^2 = 0$  is parallel to the line  $2x - y = 4$  and passes through point  $(1, 1)$ . Find;
- (i.) the equation of the chord.
  - (ii.) the coordinates of the points of intersection of the chord with the parabola.
  - (iii.) the acute angle between the chord and the directrix of the parabola.
- (9 marks)**
11. (a.) Expand  $(4 - 3x)^{\frac{1}{2}}$  in ascending powers of  $x$  up to the term in  $x^3$ . Taking  $x = \frac{1}{25}$  find  $\sqrt{97}$ . **(8 marks)**
- (b.) Find the term independent of  $x$  in the binomial expansion of  $\left(2x - \frac{1}{x^2}\right)^9$ . **(4 marks)**
12. (a.) Solve for  $x$  and  $y$  values in the equation;  $\frac{x}{2+3i} + \frac{y}{3-i} = \frac{6-13i}{9+7i}$ . **(6 marks)**
- (b.) Given that  $-4 + i$  is a root of the equation  $z^4 + 6z^3 + 6z^2 + 6z + 65 = 0$ , find the other roots of the equation and represent the roots in polar form. **(6 marks)**

13. (a.) Find the volume of a solid generated by rotating about the y-axis, the area enclosed by the curve  $y^2 + 4x = 9$ , the y-axis and  $y = -2$ . (5

**marks)**

(b.) Find  $\int x \ln(2x) dx$  . (3

**marks)**

(c.) Evaluate  $\int_0^1 \frac{2x-1}{(x-3)^2} dx$  . (4

**marks)**

14. The points A, B, C and D are given by the coordinates  $(5, 2, -3)$ ,  $(-1, 0, -1)$ ,  $(9, 5, -8)$  and  $(5, 7, -14)$  respectively. If lines AB and CD intersect at point E. Find;

(i.) Equations of lines AB and CD.

(ii.) Coordinates of point E

(iii.) The acute angle between lines AB and CD. (12 marks)

15. A curve is given by the parametric equations;  $x = 3t$  and  $y = \frac{2t^2}{1-t}$ .

(a.) Find the Cartesian equation of the curve.

(b.) Sketch the curve, showing clearly the asymptotes and turning points.

**(12 marks)**

16. (a.) Solve the differential equation  $\frac{dy}{dx} = 4x - 7$ , given that  $y(2) = 3$ . (3

**marks)**

(b.) The rate at which a candidate was losing support during an election campaign was directly proportional to the number of supporters he had at that time. Initially he had  $V_0$  supporters and  $t$  weeks later, he had  $V$  supporters.

(i.) Form a differential equation connecting  $V$  and  $t$ .

(ii.) Given that the supporters reduced to two thirds of the initial number in 6 weeks, solve the equation in (i.) above.

(iii.) Find how long it will take for the candidate to remain with 20% of the initial supporters. (9

**marks)**