

**P425 / 1**

**Pure Mathematics**

**Paper 1**

**June 2024**

**3hours**

**Uganda Advanced Certificate of Education**

**PURE MATHEMATICS**

**PAPER 1**

**SENIOR FIVE**

**3 HOURS**

**INSTRUCTIONS:**

- ❖ *Answer **all** questions in section **A** and any **five** from section **B**.*
- ❖ *Any additional question(s) answered will **not** be marked.*
- ❖ ***All** necessary working **must** be shown clearly.*
- ❖ *Begin each answer on a fresh sheet of paper.*
- ❖ *Graph paper is provided.*
- ❖ *Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.*

### **SECTION A (40 MARKS)**

Answer **all** questions from this section.

1. Solve for  $x$  in  $(x^2 + 3x + 2)^2 - 8(x^2 + 3x) - 4 = 0$ . **(05 marks)**
2. Find the equation with integral coefficient whose are the squares of the equation  $2x^2 - 3x = -4$ . **(05 marks)**
3. If  $x = \sin\theta + \tan\theta$  and  $y = \tan\theta - \sin\theta$ , show that  $(x^2 - y^2)^2 = 6xy$ . **(05 marks)**
4. Solve the equation;  $(\log_2 x)(\log_4 2x) = 6$ . **(05 marks)**
5. The expression  $6x^2 + x + 17$  leaves the same remainder when divided by  $x - a$  and  $x + 2a$ . Find the value of  $a$  where  $a > 0$ . **(05 marks)**
6. If  $x$  is so small that  $x^2$  and higher power terms can be neglected, show that;  
 $(1 - x)^5 \left(2 + \frac{x}{2}\right)^{10} \cong 2^9(2 - 5x)$  **(05 marks)**
7. Find the value of  $x$  if;  $2^{2x+8} = \frac{32 - 2^{-x}}{2^{-x}}$ . **(05 marks)**
8. Find the number of words with or without meaning that can be formed by considering all possible arrangements of the word “**FATHER**” .  
How many of these words begin with **A** and end with **R**? **(05 marks)**

### **SECTION B (60 MARKS)**

Answer **any five** questions from this section.

9. (a) When the polynomial  $x^3 - 3x + q$  is divided by  $x^2 - 3x + 2$  leaves a remainder  $px - 1$ . Find the values of  $p$  and  $q$ . **(06 marks)**  
(b) Prove that, if the difference between the roots of the equation  $ax^2 + bx + c = 0$  is  $k$ , then  $b^2 = (ka)^2 + 4ac$ . **(06 marks)**

10. (a) If  $\sin(x+\alpha) = 2\cos(x-\alpha)$ , prove that  $\tan x = \frac{2-\tan\alpha}{1-2\tan\alpha}$ .

Hence find the value of  $x$ , for  $0 \leq x \leq 360^\circ$  when  $\alpha = 45^\circ$ . **(06 marks)**

(b) Solve the equation;  $3 \cos^2 2\theta + \sin 2\theta = 1$ , for values of  $\theta$  from  $0^\circ$  to  $180^\circ$  inclusive. **(06 marks)**

11. (a) The first and fourth terms of a Geometric series are 135 and  $-40$  respectively.

Find its common ratio and sum to infinity. **(06 marks)**

(b) A student has to answer 8 out of 10 questions in an examination.

- i. How many choices does he/she have?
- ii. How many choices does he/she have if, he/she must answer the first three questions?
- iii. How many choices does she/he have if, she /he must answer at least 4 questions of the first five questions. **(06 marks)**

12. (a) Expand  $(1-x)^{\frac{1}{3}}$  as far as the term in  $x^3$ . Hence evaluate  $\sqrt[3]{24}$ . **(07 marks)**

(b) Write down and simplify the 10<sup>th</sup> term in the expansion of  $\left(2 - \frac{x}{2}\right)^{12}$ . **(05 marks)**

13. Express  $\frac{3x^3+2x^2+2x-3}{(x^2+2)(x+1)^2}$  in partial fractions. **(12 marks)**

14. (a) Use the synthetic approach to find the remainder when  $8y^3 - 10y^2 + 7y + 3$  is divided by  $2y - 1$ . **(05 marks)**

(b) Show that  $3x^3 + x^2 - 8x + 4$  is zero when  $x = \frac{2}{3}$ . Hence find the other factors. **(07 marks)**

**End**