P425/1
PURE MATHEMATICS
PRE-MOCK
JUNE/JULY 2024
3 HOURS

JOURNEY OF SUCCESS EXAMINATIONS BOARD

Uganda advanced certificate of education

PRE-MOCK EXAMINATIONS
PURE MATHEMATICS
Paper 1
3 HOURS

INSTRUCTIONS TO CANDIDATES

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

SECTION A (40 MARKS)

Answer all questions in this section

1. In an A.P the sum of the first 10 terms is 520 and the 7^{th} term doubles the 3^{rd} term. Find the first term *a* and common difference (*d*) **(05 marks)**

2. show that; $\frac{1+\tan 60^o}{1-\tan 60^o} = -(2+\sqrt{3})$ **(05 marks)**

3. Determine the co-ordinates of the turning points of the curve $y = (2x+1)\sqrt{x-2}$. **(05 marks)**

4. Prove by induction that; $\frac{1}{2}+\frac{1}{6}+\cdots..\frac{1}{n(n-1)} = 1-\frac{1}{n}$ **(05 marks)**

5. Three schools have teams of six or more runners in a cross-country race. In how many ways can the first six places be taken by the three schools, if there are no dead heats? **(05 marks)**

6. Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ in terms of α from the expressions x = $\sin^2\alpha$ and y = cos2α **(05 marks)**

7. Find the cube root of; $i-\sqrt{3}$. **(05 marks)**

8. Find the volume of the solid generated by rotating about the x-axis the area under y = $\frac{3}{4}$x from x = 0 to x = 4. **(05 marks)**

SECTION B (60 MARKS)

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

9 a) Solve for t where cost + sint = sect for $0 \leq t \leq 360°$ **(04 marks)**

b) show that; $2tan^{-1}2 + tan^{-1}3 = \pi + tan^{-1}\frac{1}{3}$ **(04 marks)**

c) Without using tables or calculator, evaluate tan195° **(04 marks)**

10 a) Sketch the locus of a point P which is represented by$|z-3+2i| < 2|z+2|$ and show the required region **(06 marks)**

b) Prove that $cos^6x + sin^6x = \frac{1}{8}(3cos^4x+5)$ **(06 marks)**

11. a) Prove that $\int_0^{\pi/2} \frac{cos\beta}{cos\beta+sin\beta} d\beta = \frac{\pi}{4}$ **(06 marks)**

b) Show that; $\int_0^{\infty} e^{-2x} sin3x\, dx = \frac{3}{13}$ **(06 marks)**

12. a) Obtain the first four terms of the expansion of $(1+\frac{1}{2}x)^8$ in ascending powers of x.

Hence find the value of $(1.004)^8$, correct to four decimal places **(06 marks)**

b) Use the Binomial theorem to expand $\sqrt{\frac{(2-x)}{(2+x)}}$ upto x^3 **(06 marks)**

13. Given the curve; $y = \frac{2x^2-9x+4}{x^2-2x+1}$.

a) Show the turning points of the curve **(04 marks)**

b) State the asymptotes **(02 marks)**

c) Hence sketch the curve **(06 marks)**

14 a) Find the perpendicular distance of the point P(0, 7, 5) from the line whose

equation is r = (i+2j- 3k) 4- μ(3i+4k)**..** **(04 marks)**

b) The points A and B have coordinates (2, 1, 1) and (0, 5, 3) respectively. Find the equation of the line AB in terms of a parameter. If C is the point (5, —4, 2)
i) Find the coordinates of the point D on AB such that CD is perpendicular to AB
ii) Find the equation of the plane containing AB and perpendicular to the line CD
(04 marks)

15. a) Determine the equation of the circle with the parametric equations $x = 1 - \sin\theta$ and $y = 1 + \cos\theta$**.** **(04 marks)**

b) Given the parabola $y^2 = 4ax$, determine the point of intersection of the two normals at

P(6,12) and at point Q($\frac{49}{6}$, 13) **(06 marks)**

16 a) solve the differential; $\frac{dy}{dx} + 4y = e^{3x}$**.** When x is 0.5 and y is 2 **(06 marks)**

b) In an established forest fire, the proportion of the total area of the forest which has been destroyed is denoted by x, and the rate of change of x with respect to time, t hours, is called the destruction rate. Investigations show that the destruction rate is directly proportional to (x-1). A particular fire is initially noticed when a quarter of the forest is destroyed, and half of the forest was destroyed after 2 hours.
Determine the quantity of the remaining forest after 4 hours **(06 marks)**

END