

P425/1
PURE MATHEMATICS
PAPER 1
3 HOURS

UGANDA ADVANCED CERTIFICATE OF EDUCATION

POST MOCK SET 8 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		
Total		

SECTION A: (40MARKS)

Answer **all** the questions in this Section.

1. Find the sum of the numbers between 5 and 250 which are exactly divisible by 4. (5marks)
2. Given that the line; $\frac{x-3}{4} = \frac{y-4}{-3} = \frac{z+3}{4}$ meets the plane $4x - 3y - 4z = 3$ at M . Find the coordinates of M . (5marks)
3. Use the substitution $x = \sin\theta$ to find the integral; $\int \frac{2x^3}{\sqrt{1-x^2}} dx$. (5marks)
4. Express $\tan(45^\circ + x)$ in terms of $\tan x$. Hence prove that; $\tan 75^\circ = 2 + \sqrt{3}$. (5marks)
5. Given $A(3, 4)$ and $B(-2, 3)$, find the equation of the locus of points $P(x, y)$ which divide AB in the ratio 2:1. (5marks)
6. A women football team manager intends to take 18 players for a tournament. The manager has 2 goal keepers, 8 defenders, 4 mid fielders and 8 strikers. In how many ways can the team be chosen if it must contain both goal keepers, at least 3 midfielders and 7 strikers. (5marks)
7. Solve the differential equation; $\operatorname{Cosec} x \frac{dy}{dx} = e^x \operatorname{cosec} x + 3x$. (5marks)
8. Solve for x in the equation; $\log_{(x+3)}(2x + 3) + \log_{(x+3)}(x + 5) = 2$. (5marks)

SECTION B (60MARKS)

Attempt any **five** questions from this Section.

9. Given that $f(x) = \frac{x^3+2x^2+61}{(x+3)^2(x^2+4)}$, express $f(x)$ in partial fraction. Hence evaluate; $\int_0^1 f(x)dx$. (12marks)
10. $P(ap^2, 2ap)$ and $Q(aq^2, 2aq)$ are two variable points on the parabola $y^2 = 4ax$. If PQ subtends a right angle at the origin, prove that $pq = -4$.
- a) Prove that PQ passes through a fixed point on the axis of the parabola.
- b) The tangents at P and Q meet at R , find the equation of the locus of R . (6marks)
11. a) Differentiate $\tan^{-1}\left(\frac{\sqrt{\ln X}}{e^{2x}}\right)$. (6marks)
- b) Evaluate the integral; $\int_0^{\frac{\pi}{6}} \frac{2\cos\theta + \sin\theta}{\cos\theta - \sin\theta} d\theta$. (6marks)
12. a) P is the foot of the perpendicular from the point $A(1, 1, 1)$ to the line $\frac{x-1}{2} = \frac{y-1}{1} = \frac{z-2}{1}$. Determine the perpendicular distance of A from the line to 4 dp's. (5marks)
- b) Given the points $A(-1, 2, 3)$ and $P(2, 3, 4)$. If the point $B(a, 2a, 3)$ lies on the plane $2x - 3y + 4z + 8 = 0$. Find the value of a and the angle between AP and AB . (7marks)
13. a) Solve the equation $\tan\theta - \cot\theta = -1$ for $0^\circ \leq \theta \leq 360^\circ$. (5marks)
- b) Prove that $\frac{\sin 3\theta}{1+2\cos 2\theta} = \sin\theta$. Hence show that $\sin 15^\circ = \frac{\sqrt{3}-1}{2\sqrt{2}}$. (7marks)

14. a) Prove that $\log_a^b = \frac{1}{\log_b a}$. hence solve the equation $\log_2 x + \log_x 2 = 2.5$. (5marks)

b) A polynomial is given by $P(x) = x^3 + Ax^2 + x - 6$. The ratio of the remainder when $P(x)$ is divided by $(x + 1)$ to the remainder when divided by $(x - 2)$ is $-1:5$. find the value of A. (7marks)

15. a) If $Z = \frac{1+i\sqrt{3}}{1-i\sqrt{3}}$, express Z in modulus argument form. (5marks)

b) Use demoiver's theorem to prove that $2\cos\theta = Z + \frac{1}{Z}$ then

$2\cos n\theta = Z^n + \frac{1}{Z^n}$. Hence solve the equation

$$5Z^4 - 11Z^3 + 6Z^2 - 11Z + 5 = 0. \quad (7marks)$$

16. a) Determine the nature of the turning points of the curve $y = x(1 - x)^2$. (5marks)

b) The acceleration of a particle is proportional to $2t-3$. If the velocity increases from 4ms^{-1} to 8ms^{-1} in the first 2 seconds of motion, find;

i) its initial acceleration (5marks)

ii) the velocity after 5 seconds. (2marks)

**** **END** ****