UGANDA ADVANCED CERTIFICATE OF EDUCATION

POST MOCK EXAMINATIONS

P425/1 MATHEMATICS PRINCIPAL

PAPER ONE

Time: 3 hours

INSTRUCTIONS TO CANDIDATES:

Attempt all the **eight** questions in section **A** and not more than **five** from section **B**.

Show all the necessary working up to the last step of the solution.

Mathematical tables and graph papers are provided.

Silent Simple non-programmable calculators may be used.

State the degree of accuracy of questions attempted using calculator or table. Indicate **Cal** for calculator or **Tab** for Mathematical tables

SECTION A (40 marks)

1 Solve the simultaneous equations $2/(x + 8y) – 1/(8x – y) = 4$
$1/(x + 8y) + 2/(8x – y) = 7$.

2 Solve for x, $\sin 4x = \cos x$, giving the solution between 0^0 and 180^0.

3 Find the y intercept of the line normal to the curve $y = 3x – x^3$ at the point (3,-18).

4 Prove that $1 – \tan^2 x + \tan^3 x +$ -------- $= \cos^2 x$.

5 Find the area of the largest rectangle, which can be inscribed in the semicircle of radius 2 cm.

6 If $y = (1 – \cos x) / (1 + \cos x)$ show that $dy/dt = t + t^3$ where $t = \tan x/2$.

7 I f $a/b = b/c = c/d$, prove that $(ab + bc + ca) / (bc + cd + db) = (a/d)^{2/3}$.

8 Find the area of a triangle ABC where **a** = 4**i** + 3**j** –**k**, **b** = -2**i** + 4**j** + **k** and **c** = 3**i** + **j** + 2**k**.

SECTION B (60 marks)

9(a) Solve the equation $(2 + i)Z^2 – Z + (2 + i) = 0$.

(b) Determine the region on the complex plane represented by $1 <|z +2i|< 2$.

10(a) Find the value of a such that 2**i** – 3**j** + 5**k** and 3i + a**j** –2**k** are perpendicular.

(b) Find the shortest distance from the point (3,2,1) to the plane determined by (1,1,0), (3, -1, 1) and (-1, 0,2).

11(a) Find the values of x between 0^0 and 360^0 inclusive for which $2\sin3x + \cos2x = 1$.

(b) Express $y = \cos x – \sqrt{3} \sin x$ in the form $R \cos (x + \alpha)$ where R is a positive constant and α is acute; hence or otherwise:

i) Sketch the graph of y against x for values of x from 0^0 to 360^0.

ii) Give the solution of $\cos x -\sqrt{3} \sin x + 2 = 0$ between 0^0 to 360^0

12(a) (i) Differentiate $y =(e^{2x} \ln x) / (x - 1)^3$

(ii) Given $y = [(1 – x^2) / (1 + x^2)]^n$ prove that $(1 - x^2)dy/dx +4nxy = 0$

(b) A cylinder has dimensions r = 5 cm and h = 10 cm. Find the approximate increase in volume of the cylinder when r increases by 0.2 cm and height decreases by 0.1 cm

13(a) Show that if the equations $x^2 +2px +q = 0$ and $x^2 + 2Px + Q = 0$ have a common root then $(q – Q)^2 + 4(P –p)(Pq – Pq) = 0$

(b) Prove that $y = x /(x^2 +1)$ lies between y ± ½. Hence or otherwise sketch the curve $y = x /(x^2 +1)$

14(a) Find the point of intersection A of the tangents to the parabola $y^2 = 4ax$ at the points P $(ap^2, 2ap)$ and Q $(aq^2, 2aq)$. If the angle PAQ = 900 show that

i) the x – coordinate of a is –a

ii) PQ passes through the focus of the parabola.

(b) The tangent at p $(at^2, 2at)$ to the parabola $y^2 = 4ax$ cuts the y-axis at A and the x-axis at B. find the locus of the centroid of triangle AOB.

15(a) Evaluate $\int (x\sin x\cos x)dx$ from $x = 0$ to $x = \frac{1}{4}\pi$

(b) Find A, B. C and D such that

$$\frac{(2 + 5x + 3x^2 + 3x^3)}{x(x^2 + 1)(x + 2)} = \frac{A}{x} + \frac{1 + x^2}{(Bx + C)} + \frac{D}{x + 2.}$$

Hence $\int \frac{(2 + 5x + 3x^2 + 3x^3)}{x(x^2 + 1)(x + 2)} dx.$

16 (a) Find the general solution of the differential equation $\sin x/(1 + y)dy/dx = \cos x$.

(b) An electric circuit contains 8 ohm resistor in series with an inductor of 0.5 henries and a battery of E volts. At time $t = 0$ the current $I = 0$.

(i) Form a differential equation that gives current at any time t greater than zero

(ii) Find the maximum current when $E = 32e^{-8t}$

THE END