KIIRA COLLEGE BUTIKI

Uganda Advanced Certificate of Education

PURE MATHEMATICS

Paper 1

LOCK DOWN REVISION QUESTIONS

SECTION A (40 marks)

1. Solve the inequality

   $\frac{x(x+2)}{x-3} \leq x+1$ (5 marks)

2. Show that the line $\frac{x-2}{2} = \frac{y-2}{-1} = \frac{z-3}{3}$

   Is parallel to the plane 4x-y-3z=4 and find the perpendicular distance of the line from the plane. (5 marks)

3. Solve the equation

   2tan x-3cot x=1

   For $0^o \leq x \leq 360^o$ (5 marks)

4. Calculate the co-ordinates of the point of the intersection of the curve

   $\frac{x}{y} + \frac{6y}{x} = 5$ and $2y = x - 2$ (5 marks)

5. The tangent to the curve $y = 2x^2 + ax + b$ at the point (-2,11) is perpendicular to the line $2y = x + 7$. Find the value of a and b. (5 marks)

6. Evaluate $\int_{o}^{\frac{\pi}{3}} cos3xcos2xdx$ (5 marks)

7. Given that φ in a root of the equation $x^2 - 2x + 3 = 0$ show that $\varphi^3 = x - 6$

   (5 marks)

8. A spherical balloon is being inflated by gas being pumped at the constant rate of $200cm^3$ per second. What is the rate of increase of the surface area of the ballon when its radius is 100cm? (5 marks)

SECTION B (60 MARKS)

9. (a) $If\ (x+1)^2\ is\ factor\ of\ 2x^4+7x^3+6x^2+Ax+b,$ find the value of A and B. (5 marks)

(b) Prove that, if the equations $x^2+ax+b=0\ and\ cx^2+2ax-3b=0$ have a common root and neither a and b is zero, then

$b=\frac{5a^2(c-2)}{(c+3)^2}$ (7 marks)

10. (a) Given that $y=loge(\frac{3+4cosx}{4+cosx})$ find $\frac{dy}{dx}$ in the simplest form. (7 marks)

(b) $If\ y=e^{4x}cos3x, prove\ that\ \frac{d2y}{dx^2}-8\frac{dy}{dx}+25y=o$ (7 marks)

11. (a) Given that $z=cos\theta_{sin\theta}, where\ \theta\neq\pi, show\ that\ \frac{2}{1+z}=1-itan\frac{1}{2}\theta.$

(6 marks)

(b) The polynomial $p(z)=z^4-3z^3+7z^2+21z-26\ has\ 2+3i$ $as\ one\ of\ the\ roots. Find\ the\ other\ three\ roots\ of\ the\ equation\ p(z)=o$

(6 marks)

12. (a) A right circular cone with semi vertical angle θ is inscribed in a sphere of radius γ, with its vertex and rim of its base on the surface of the sphere. Prove that its volume is $\frac{8}{3}\pi r^3cos^4\theta sin^2\theta.$ (6 marks)

(b) If r in constant and θvaries, show that the limits within which this volume must lie is $0<v<\frac{32\pi r^3}{81}1$ (6 marks)

13. (a) In any triangle ABC, prove that $tan\frac{1}{2}(B-C)=\left(\frac{b-c}{b+c}\right)tan\frac{1}{2}(B+C)$

(6 marks)

(b) In a particular triangle the angle A is 51° and b=3c. Find the angle B to the nearest degree. The area of this triangle in 0.47m^2. Find side a to three decimal places.

14. (a) The points A and B have position vector i-2jtk and 2ijk respectively. Given that $0c=\boldsymbol{\lambda}$OA $+\mu OB\ and\ OC\ is\ perpendicular\ to\ OA, find\ the$ Ratio of $\boldsymbol{\lambda}$ to μ.

Write down the vector equation of the line, L through A which is perpendicular to OA. Find the position vector of P, the point of intersection of Land OB. (12 marks)

15. (a) Determine the equation of the normal to the eclipse $x\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ at a point p(a cos θ, bsin θ. (6 marks)

(b) If the normal at p meets the x – axis at A and the y – axis at B, Find the locus of the midpoint of AB. (6 marks)

16. (a) Solve the differential equation $x\frac{dy}{dx} = y + x^2(cosx + sinx),$ given that $y = o\ when\ x\frac{\pi}{2}$ (5 marks)

(b) The rate of decay of a radioactive substance is proportional to the amount A remaining at any time t. If initially the amount was Ao and if the time taken for the amount of substance to become ½ Ao is T, find A at that time.

Find the time taken for the amount remaining to be reduced to $\frac{1}{20}Ao$

(7 marks)