CHUKA UNIVERSITY

UNIVERSITY EXAMINATION
RESIT/SUPPLEMENTARY / SPECIAL EXAMINATIONS
EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE

MATH 124: GEOMETRY AND LINEAR ALGEBRA

STREAMS: **TIME: 2 HOURS**

DAY/DATE: THURSDAY 04/11/2021 **2.30 P.M - 4.30 P.M.**

INSTRUCTIONS:

- **All questions on this question paper are compulsory**

QUESTION ONE (30 MARKS)

(a) Determine the centre and the radius of the circle whose equation is

$x^2 + y^2 - 4x - 2y - 15 = 0.$ (4 marks)

(b) Find the equation of a circle whose centre is at the point $(2,3)$ and which passes through the point$(2,2)$ in the form $ax^2 + by^2 + cx + dy + f = 0$ (5 marks)

(c) A line L_1 passes through $(1,2)$ and has a gradient of 5. Another line L_2 is perpendicular to L_1 and meets it at the point where $x = 4$.Find the equation of L_2 (5 marks)

(d) A plane has the equation $2x + 3y + 6z + 28 = 0$. Calculate the shortest distance of the point $(-1,1,1)$ from the plane. (3 marks)

(e) Find the equation of the hyperbola in standard form if its centre is the origin and the points $(6,-1)$and $(8,\sqrt{8})$ lie on it. (4 marks

(f) Solve the quadratic equation $x^2 - \frac{2}{5}x + \frac{1}{5} = 0$ (4 marks)

(g) Find the eccentricity of $\frac{y^2}{25} - \frac{x^2}{4} = 1$ (5 marks)

QUESTION TWO (20 MARKS)

(a). Analyze fully and graph the equation

$x^2 + 4y^2 + 4x - 8y + 7 = 0$ (12 marks)

(b) If **AB=a** and **AC=b**, show that the area of the triangle ABC is given by

Area=$\sqrt{(ab)^2 - (\mathbf{a.b})^2}$ (4 Marks)

(c) Hence or otherwise find the area of the triangle whose vertices are A(1,-5,3) , B(-1,1,6) and C(3,0,1). (4 Marks)

QUESTION THREE (20 MARKS)

(a) Use matrix inverse method to solve

$$2x + y - 4z = 3$$

$$x + 2y - z = 7$$

$$z - y + 3x = 4$$

(11 Marks)

(b) Convert $6xy = c^2$ into polar coordinates. (3 marks)

(c) Given that $Z_1 = 4i + 3$ and $Z_2 = 7i - 2$ find

(i) Z_1Z_2 (2 marks)

(ii) a and b given $\frac{Z_2}{Z_1} = ax + bi$ (4 marks)

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