CHUKA   **UNIVERSITY**

SUPPLEMENTARY / SPECIAL EXAMINATIONS

FIRST YEAR EXAMINATION FOR THE AWARD OF BACHELOR OF SCIENCE IN ENVIRONMENTAL SCIENCE

MATH 124: GEOMETRY AND LINEAR ALGEBRA.

STREAMS:

TIME: 2 HOURS

DAY/DATE: WEDNESDAY   18/11/2020   **8.30 A.M – 10.30 A.M.**

INSTRUCTIONS:
- Attempt all the questions

QUESTION ONE: (30 MARKS)

a. Find the slope and the inclination of the line L through the points $P_1(1,-1)$ and $P_2(4,2)$
(3 marks)

b. Find the perpendicular bisector of the segment with and points $P_1(-4,3)$ and $P_2(2,-1)$
(3 marks)

c. Let $\vec{a} = (2,-1,3),\ \vec{b} = (-1,4,-2)$ and $\vec{c} = (1,8,7)$. Calculate vector $2\vec{a} + \vec{b} - \vec{c}$
   and then find the magnitude   (3 marks)

d. Find the equation of the parabola with the point $(1,1)$ as its focus and the line $x + y = -2$ as
   its directrix
        (6 marks)

e. Find the eccentricity of the ellipse shown below   (3 marks)

$$\frac{x^2}{9} + \frac{y^2}{4} = 0$$

f. Find the distance between the point $(3, 1)$ and the line $3x+4y-3=0$ (3 marks)

g. Find the centre and radius of circle given by $x^2 + 4x + y^2 - 14y = 47$ (3 marks

h. Analyse the graph of the equation $\dfrac{x^2}{16} - \dfrac{y^2}{9} = 1$ (6 marks)

QUESTION TWO: (20 MARKS)

a. Write the equation, foci and the asymptotes of a hyperbola that has vertices $(\pm 3, 0)$ and passes through the point $P(5, 2)$ (8 marks)

b. Find the determinant of the matrix $\mathbf{A} = \begin{pmatrix} 2 & 3 & -3 \\ 2 & -1 & 2 \\ 2 & 4 & -4 \end{pmatrix}$, (4 marks)

c. Solve for x and y in the system of equations below $3x + y = 5$ and $x - y = -1$ by matrix method
(5 marks)

d. Find the angle α between the lines $y = 3x - 1$ and $y = 1 - 2x$ (3 marks)

QUESTION THREE: (20 MARKS)

a. Find the angle between the vectors $\tilde{\mathbf{a}} = \mathbf{i} - 2\mathbf{j}$ and $\tilde{\mathbf{b}} = -4\mathbf{i} + \mathbf{j} - 2\mathbf{k}$ (3 marks)

b. Find the area of parallelogram with consecutive vertices A(1, 3, -2), B(2, 1, 4) and C(-3, 1, 6) (5 marks)

c. Sketch the graph of polar equation $r = 4\sin\theta$ (4 marks)

d. Solve the equation by inverse matrix method $2x + y + 2z = 5$, $4x + 2y + 3z = 9$, $2x + 2y + z = 3$ (5 marks)

e. Find an equation of the line with slope m=-1 passing through point P(2,-1) (3 marks)

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