(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2022/2023 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER

MAIN EXAMINATION

FOR THE DEGREE OF BACHELOR OF EDUCATION AND BACHELOR OF SCIENCE

COURSE CODE: **MAA 122**

COURSE TITLE: ELEMENTARY APPLIED MATHEMATICS

DATE: 12/04/23 **TIME:** 9 AM -11 AM

INSTRUCTIONS TO CANDIDATES

Answer Question ONE and Any other TWO Questions

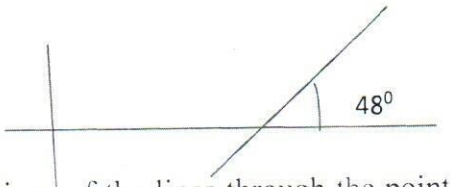
TIME: 2 Hours

This Paper Consists of 3 Printed Pages. Please Turn Over.

QUESTION ONE (30 MARKS)

a) Differentiate between a vector and a scalar and give examples. (4 marks)

b) Calculate the gradient of the straight line shown: (3 marks)



c) Find equations of the lines through the point (1,2) parallel and Perpendicular to the line $3x+4y=7$. (6 marks)

d) Two straight lines $my=2$ and $x-my=3$ are perpendicular. Find the possible values of m. (5 marks)

e) The line through point A(3,-3) and B(x,y) has the equation $5x-y-18=0$. Find the equation of the line through A and is perpendicular to AB. (3 marks)

f) A line L_1 makes an angle of 45^0 with the positive direction of the x- axis. Another line L_2 makes an angle of 153.43^0 with the positive direction of the x-axis. The two lines intersect at the point (4,m). Given that L_1 passes through the point (2,0).Find:

i. The value of m (2 marks)

ii. The equation of L_1. (3 marks)

iii. The point where L_2 intersects with the x-axis. (4 marks)

QUESTION TWO (20 MARKS)

a) Define the median of a triangle. (2 marks)

b) Triangle ABC has vertices A (4,-9), B(10,2) and C(4,-4).Find the equation of the median from A. (4 marks)

c) Triangle ABC has vertices at A (3,-5), B (4, 3) and C (7, 2). Find the equation of the altitude from A. (3 marks)

d) Two points A (2, 3) and B (4, 7) lie on a straight line .Find the equation of the perpendicular bisector of AB. (5 marks)

e) Write the equation of the circle with the centre at the origin and radius r. (2 marks)

f) Give the general equation of a circle. (2 marks)

g) Write the equation of a circle with the centre (a, b) and radius r (2 marks)

QUESTION THREE (20 MARKS)

a) Find the equation of the circle passing through the points A (1, 3), B (2, 2) and C (5, 7). (10 marks)

b) Find the centre and radius of a circle passing through the points P (2, 1), Q (0, 5) and R (-1, 2). (10 marks)

QUESTION FOUR (20 MARKS)

a) Determine the magnitude of the vector $< 3, -5, 10 >$ (2 marks)

b) Find the unit vector in the same direction as $\vec{w}=< -5,2,1 >$ (3 marks)

c) Given $\vec{A}$ =2i +3j+2k and $\vec{B}$=i+j+5k.Find :

i. $\vec{A} \cdot \vec{B}$ (2 marks)

ii. The angle between $\vec{A}$ and $\vec{B}$. (5 marks)

d) If $\underset{\sim}{a}=< 2,1,-1 >$ and $\underset{\sim}{b}=< -3,4,1 >$. Compute the following:

i. $\underset{\sim}{a} \times \underset{\sim}{b}$ (3 marks)

ii. $\underset{\sim}{b} \times \underset{\sim}{a}$ (3 marks)

e) Express the equation x=1 in polar coordinates. (2 marks)

QUESTION FIVE (20 MARKS)

a) A stone is projected vertically upwards with a velocity of 30 ms^{-1} from the ground. Calculate:

i. The time it takes to reach the maximum height. (2 marks)

ii. The maximum height. (2 marks)

iii. The velocity with which it lands on the ground. (3 marks)

b) A 325kg motorcycle is moving at 140km/h in the south. Find its momentum. (2marks)

c) Find the area of the region bounded by the curve $r=3+2\cos\theta$ (3 marks)

d) Find the line through the points P_1 (-3,1,-4) and P_2(4,4,-6) in :

i. Parametric form. (3 marks)

ii. Symmetric form. (3 marks)

e) Find the equation of the plane perpendicular to the vector $\underset{\sim}{n}$=(2,4,8) (2 marks