



(Knowledge for Development)

KIBABII UNIVERSITY
UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR
FIRST YEAR SECOND SEMESTER
MAIN EXAMINATION
FOR THE DEGREE BACHELOR OF SCIENCE

COURSE CODE: MAA 122

COURSE TITLE: ELEMENTARY APPLIED MATHEMATICS

DATE: 10/05/2022

TIME: 2:00 PM – 4:00 PM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

This Paper Consists of 2 Printed Pages. Please Turn Over.

QUESTION ONE (30 MARKS)

- a) Find the line through the points $P_1 = (-3, 1, -4)$ and $P_2 = (4, 4, -6)$ in vector, parametric and symmetric form (5mks)
- b) Show that $\vec{w} \times \vec{v} = -\vec{v} \times \vec{w}$ (3mks)
- c) Find the equation of the straight line joining the point (3,1) to the mid-point of the join of (2,4) and (7,10) (4mks)
- d) State the first, second and third newton's laws of motion. (4mks)
- e) Determine the angle between $\vec{a} = 2i + 3j + 2k$ and $\vec{b} = i + j + 5k$ (5mks)
- f) A plane is defined by 3 points as $P(1,0,0)$, $Q(1,1,1)$ and $R(2, -1, 3)$. Find the vector that is orthogonal to the plane (4mks)
- g) Find the direction cosine and direction angles for $\vec{a} = (2, 1, -4)$ (4mks)

QUESTION TWO (20MARKS)

- a) Prove that (10mks)
- i. $\|a \times b\| = \|a\| \|b\| \sin \theta$ (6mks)
- ii. $(\vec{A} \times \vec{B}) \cdot \vec{A} = 0$
- b) Find the projection of the vector $\vec{a} = i - 2j + k$ on the vector $\vec{b} = 4i - 4j + 7k$ (4mks)

QUESTION THREE (20MARKS)

- a) Determine the center and the radius of the circle passing through the points $P(1,3)$, $Q(2,2)$ and $R(5,7)$ (10mks)
- b) Show that the circles $x^2 + y^2 + 2x + 2y - 2 = 0$ and $x^2 + y^2 + 4x + 6y + 12 = 0$ are orthogonal (6mks)
- c) Find the equation of the perpendicular bisector of AB , given $A(2,3)$ and $B(4,7)$ (4mks)

QUESTION FOUR (20MARKS)

- a) Find the area enclosed between the curves $r_1 = 1 + \sin \theta$ and $r_2 = 3 \sin \theta$ (10mks)
- b) Sketch a graph given the polar form as $r = 1 + \cos \frac{\theta}{2}$ (10mks)

QUESTION FIVE (20MARKS)

- a) Find the equation of the plane P containing the points (2,1,3), (1, -1, 2) and (3,2,1) (10mks)
- b) Find the line of intersection of the planes in vector, parametric and symmetric form $5x - 3y + z - 10 = 0$ and $2x + 4y - z = -3$ (10mks)