



(Knowledge for Development)

KIBABII UNIVERSITY
UNIVERSITY EXAMINATIONS
2017/2018 ACADEMIC YEAR
SECOND YEAR SECOND SEMESTER
MAIN EXAMINATION

**FOR THE DEGREE OF BACHELOR OF EDUCATION AND
BACHELOR OF SCIENCE**

COURSE CODE: MAT 224

COURSE TITLE: ANALYTIC GEOMETRY

DATE: 31/07/18

TIME: 2 PM -4 PM

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) Find the focus and the directrix of the parabola $(x + 2)^2 - 8y + 16 = 0$ (4 mks)
- (b) Given the curve $y = x^{\frac{3}{2}}$ calculate its length from $x = 0$ to $x = 4$ (5mks)
- (c) Show that the planes given by the equations below are parallel and hence calculate the distance between them,
 $4x - 4y + 2z + 6 = 0$
 $6x - 6y + 3z + 4 = 0$ (4mks)
- (d) Write the equation of a line through the points $P_1 = (-3, 1, -4)$ and $P_2 = (4, 4, -6)$ in parametric form. (3mks)
- (e) Find the center and the radius a circle whose equation is given by;
 $x^2 + y^2 - 4x - 6y = -12$ (4mks)
- (f) Convert the Cartesian coordinates $(3, 4)$ in cylindrical coordinates. (3mks)
- (g) A plane P contains the points $(2, 1, 3)$, $(1, -1, 2)$ and $(3, 2, 1)$. Write the equation of the plane in normal form. (4mks)
- (h) Write the equation $2x^2 + 2y^2 = z^2$ in cylindrical coordinates. Simplify your answer. (3mks)

QUESTION TWO (20 MARKS)

- (a) Define the following terms;
a) Parabola
b) Ellipse
c) Hyperbola (6mks)
- (b) A curve is given by the equation $4x^2 + 9y^2 - 16x - 54y + 61 = 0$
(i) Write the equation in standard form (3mks)
(ii) Identify the center, vertices and foci of the curve (4 mks)
(iii) Sketch the curve (3 mks)
- (c) A parabola with the center $(2, 3)$ cuts the x - axis at the points, $(-3, 3)$ and $(7, 3)$ and y - axis at the points $(2, 5)$ and $(2, 1)$. Find the equation of the curve in the form $x^2 + y^2 + ax + by + c = 0$ (4mks)

QUESTION THREE (20 MARKS)

- a) A plane P has three points $(2, 5, 6)$, $(2, 1, 8)$ and $(3, 4, 7)$. The plane intersects with a line through points $(2, 1, 4)$ and $(4, 3, 8)$ at point M. Find;
(i) the equation of the plane P in a normal form (4mks)
(ii) equation of the line in parametric form (3mks)
(iii) the coordinates of M (3mks)
(iv) the ratio in which the plane divides the line (3mks)
(v) determine if the vector $\mathbf{i} + 3\mathbf{j} - \mathbf{k}$ is parallel to the plane (2 mks)
- b) A vector $\mathbf{n} = \langle 2, 1, 3 \rangle$ is perpendicular to another plane Q containing a point $(2, 1, 4)$. Find the equation of the line of intersection of the two planes, P and Q in parametric form. (5mks)

QUESTION FOUR (20 MARKS)

- (a) Give equations showing the relationship between the Cartesian coordinates and spherical coordinates, and also Cartesian coordinates and cylindrical coordinates. (5mks)
- (b) Given a point $P = (1, 2, 1)$ in Cartesian coordinates, convert it to;
- (i) Cylindrical coordinates (3mks)
- (ii) Spherical coordinates. (4mks)
- (c) Write the equation $y^2 + x^2 = -z^2$ in both spherical and cylindrical coordinates. (simplify your answers where possible) (7mks)
- (d) Describe the surface given by the equation, $x^2 + y^2 + z^2 = 36$ (1mk)

QUESTION FIVE (20 MARKS)

- (a) Given lines whose direction ratios are given by the relations $l + m + n = 0$ and $l^2 + m^2 - n^2 = 0$, find the angle between the lines. (8mks)
- (b) Find the equation of the locus of the point whose distance from the point $(2, -2, 2)$ is two times its distance from the plane $2x + 3y - 6z = 2$ (7mks)
- (c) A line through points $(2, 1, 4)$ and $(3, 8, 5)$ intersects with another line whose direction cosine are $(2, 0, 3)$ (5mks)