(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2016/2017 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER

SPECIAL/ SUPPLEMENTARY EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE

MATHEMATICS

COURSE CODE: **MAT 224**

COURSE TITLE: ANALYTIC GEOMETRY

DATE: 21/09/17 **TIME:** 11.30 AM -1.30 PM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

QUESTION ONE

(a) Write the equation of a curve $\frac{x^2}{25} + \frac{y^2}{4} = 1$ in parametric form. (2 mks)

(b) Find the arc length of the curve $y = x^{\frac{3}{2}}$ from $x = 0$ to $x = 4$ (5mks)

(c) Write the vector form of a line through the points P_1 = (-3, 1,-4) and P_2 = (4, 4,-6) in parametric form. (3mks)

(d) Find the center and the radius of the circle $x^2 + y^2 - 4x - 6y = -12$ (3mks)

(e) Write the equation of a plane P containing the points (2,1,3), (1,-1,2) and (3,2,1) (3mks)

(f) Given, the point (-2,-2,1), in Cartesian coordinates, covert it to

(i) Cylindrical coordinates

(ii) Spherical coordinates

(g) Sketch and identify the curve defined by the parametric equations;

(i) $x = 4\cos t, y = 2\sin t\ 0 \leq t \leq 2\pi$ (3mks)

(ii) $x = \cos t, y = \sin t\ 0 \leq t \leq 2\pi$ (3mks)

QUESTION TWO

(a) Given the equation of a circle $x^2 + y^2 = r^2$.

(i) Write this equation in parametric form (3mks)

(ii) Show that the length of the curve from $t = 0$ to $t = 2\pi$ is $2\pi r$ (4mks)

(b) Sketch and identify the curve defined by the parametric equations $x = t\cos t, y = t\sin t$ for0 $\leq t \leq 3\pi$. (4mks)

(c) Find the equation of a planeP containing the point (-3,1,3) and perpendicular to the vector, $n =< 2,4.8 >$ (4mks)

(d) Find the vector equation of a line through the points P_1 = (-3, 2,-4) and P_2 = (4, 4,-6) in symmetric form. (4mks)

QUESTION THREE

(a) Below is an equation of a parabola. Identify the foci and the directrix and hence sketch its graph.
$3x^2 = 8y$ (6mks)

(b) Discuss and sketch the graph of the ellipse $3x^2 + 9y^2 = 27$ (7mks)

(c) Convert the equation of the parabola $y^2 + 2y + 8x + 17 = 0$ to standard form and sketch its graph, (5mks)

(d) In terms of eccentricity, differentiate between a parabola and an ellipse. (2mks)

QUESTION FOUR

(a) Given that a line L passes through the point P = (2,3,5) and is parallel to the vector **n** = <4,-1,6>;

(i) Write the equation of the line L in vector, parametric and symmetric forms. (4mks)

(ii) Determine whether the point (6, 2, 1) lies on the line L. (2mks)

(b) A plane P passes through the point (-3, 1, 3) and is perpendicular to the vector **n** = < 2, 3, 8>. Calculate;

(i) The equation of the plane in normal form. (3mks)

(ii) The distance of the point (1, 2, 2) from the plane. (3mks)

(c) Find the angle between the lines whose direction ratios are (1,2,2) and (2,3,1) (4mks)

(d) Calculate the length of the curve $y = 2x^2$ in the interval, $2 < x < 4$ (4mks)

QUESTION FIVE

(a) Give equations showing the relationship between the Cartesian coordinates and spherical coordinates, and also Cartesian coordinates and cylindrical coordinates. (4mks)

(b) Given a point P= (1,2,1) in Cartesian coordinates, convert it to;

(i) Cylindrical coordinates (3mks)

(ii) Spherical coordinates. (5mks)

Write the equation $y^2 + x^2 = z$ in both spherical and cylindrical coordinates.(simplify your answers where possible)