(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: 18/01/18 **TIME:** 9 AM -11 AM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

QUESTION ONE (30 MARKS)

a) Convert the equation of the curve$x = 1 + 2\cos\theta$,$y = 3 + 2\sin\theta$ into Cartesian form and hence identify the curve. (3 mks)

b) Determine the length of the curve $x = \frac{2}{3}(y-1)^{\frac{3}{2}}$, for $1 \le x \le 4$ (4 mks)

c) Find the coordinates of the point where the line $x = 2 + t,\, y = -t,\, z = 2t$ crosses the plane $2x + y + z = 16$ (4 mks)

d) A point P divides a line joining points (2, 3, 4) and (6, 2, 4) in the ratio 3:2. Find the coordinates of the point P. (3 mks)

e) Convert the Cartesian coordinate (2√3, 6, -4) to spherical coordinate. (4 mks)

f) Show that the planes $2x + 3y + z + 3 = 0$ and $3x + 4.5y + 1.5z - 4 = 0$ are parallel and hence find the distance between them. (4 mks)

g) Identify vertices and foci of the curve$\frac{(x-2)^2}{16} + \frac{(x-4)^2}{9} = 1$. Sketch the curve(5 mks)

h) Determine the angle between the lines whose direction ratios are (1, 1, 2) and (√3, -√3, 1) (3 mks)

QUESTION TWO (20 MARKS)

a) Line L_1 passes through the points (2, 1, 3) and (4, 2, 2) and meets line L_2 at a point M.if the directioncosine of L_2 is (2, 2, 4), find the acute angle between the lines. (4 mks)

b) Determine the acute angle between the lines whose direction cosines are $\left(\frac{1}{2}, \frac{1}{\sqrt{2}}, 3\right)$ and $\left(6, \frac{1}{\sqrt{2}}, 3\right)$ (3 mks)

c) Find the direction cosine of a line normal to the lines whose equations are
$x = 4 - t,\, y = -3 + 2t,\, z = 5 - 3t$
$x = -2t - 4,\, y = t - 1,\, z = 3t + 2$ (6 mks)

d) Find the direction cosine of the perpendicular from the point (1, 2, 1) to the line $x - 2 = -y - 1 = \frac{z+1}{-3}$ (7 mks)

QUESTION THREE (20 MARKS)

a) A curve has the parametric equations $x = 1 + 3\cos\theta$ and $y = 3 + 3\sin\theta$
   i. Sketch the curve (7 mks)
   ii. Convert the equations into Cartesian form and identify it. (3 mks)

b) Identify the curve given by the equations $x = 2 + 3\cos\theta$ and $y = 5 + \sin\theta$ (2 mks)

c) By the help of trigonometric functions, convert the equations below into parametric form.
   i. $\frac{(x+4)^2}{2} - \frac{(x-1)^2}{8} = 1$ (4 mks)
   ii. $\frac{(x-1)^2}{3} + \frac{(x+4)^2}{7} = 1$ (4 mks)

QUESTION FOUR (20 MARKS)

a) Define the following terms;

i. Parabola (2 mks)

ii. Hyperbola (2 mks)

iii. Ellipse (2 mks)

b) Given the curve $9x^2 - 4y^2 - 72x + 8y + 176 = 0$, find the foci, centre and asymptotes of the curve and hence sketch it. (7 mks)

c) An ellipse has foci (2, -2), (4, -2) and vertices (5, -2), (1, -2)

i. Find the equation of the curve. (4 mks)

ii. Sketch the curve (3 mks)

QUESTION FIVE (20 MARKS)

a) Derive the relationship between

i. Cartesian and cylindrical coordinates (3mks)

ii. Cartesian and spherical coordinates (4 mks)

b) Convert the Cartesian coordinate (2, -1, 1) into

i. Cylindrical coordinate (3 mks)

ii. Spherical coordinate (3 mks)

c) Carry out the following conversions

i. The Cartesian equation $x^3 + 2x^2 - 6z = 4 - 2y^2$ to cylindrical coordinates (3 mks)

ii. The Cartesian equation $x^2 + y^2 = -z^2 - 2$ to spherical coordinates (4 mks)