KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2016/2017 ACADEMIC YEAR
FIRST YEAR, FIRST SEMESTER EXAMINATION
FOR THE DEGREE OF BACHELOR OF SCIENCE
(MATHEMATICS)

Date: 10$^{\text{th}}$ August, 2016.
Time: 8.30am – 10.30am

KMA 101   - INTRODUCTION TO ANALYTICAL GEOMETRY

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 MARKS)

a)   Find the Cartesian coordinates of the point whose polar coordinates is $\left(3, \frac{\pi}{6}\right)$.

(4 Marks)

b)   Find the distance between the points $(3,6)$ and $(-2,5)$.

(3 Marks)

c)   Find the gradient of the line passing through the points $(3,7)$ and $(-1,23)$

(3 Marks)

d)   A point $P(X,Y)$ is equidistant from the line $x + 2y = 3$ and the point $(2,0)$. Find the equation relating X and Y.

(5 Marks)

e)   Find the equation of the tangent from the origin to the circle;
$x^2 + y^2 - 5x - 5y + 10 = 0$

(5 Marks)

f)   Derive the equation of the parabola with its vertex at $(3,2)$ and its focus at $(5,2)$.

(5 Marks)

g)   Derive the equation of the ellipse having the centre at the origin, one focus at $(5,3)$ and the length of semi-major axis is 5.

(5 Marks)

QUESTION TWO (20 MARKS)

a)   Find the equation of the circle with centre on the y axis which cuts orthogonally each of the circles
$x^2 + y^2 + 6x + 2y - 9 = 0$ and $x^2 + y^2 - 2x - 2y + 1 = 0$.

(5 Marks)

b)   The points $A(x_1, y_1)$ and $B(x_2, y_2)$ are the ends of a diameter of a circle. Find the equation of the circle.

(5 Marks)

c) The length of the tangent from the point C(2,3) to the circle $x^2 + y^2 - 4x - 6y + k = 0$ is 2 units. Find the value of k.

(5 Marks)

d) A circle passes through the points $A(-3, -4), B(-5, 2), C(1,8)$. Find the point of the perpendicular bisector of AB and BC.

(5 Marks)

QUESTION THREE (20 MARKS)

a) Write the equation of the parabola with its vertex at the point (2,3) with its axis parallel to the y axis and which passes through the point (4,5)

(6 Marks)

b) Given the parabola whose equation is $y^2 + 8y - 6x + 4 = 0$. determine the coordinates of the vertex, the coordinates of the focus and the equation of the directrix.

(7 Marks)

c) Given the ellipse $4x^2 + 9y^2 - 48x + 72y + 144 = 0$. Find its centre, semi-axes, vertices and foci.

(7 Marks)

QUESTION FOUR (20 MARKS)

a) Find the coordinates of the vertices and foci, the equation of the directrices, the equation of the asymptotes, the length of the latus rectum, the eccentricity of the hyperbola $9x^2 - 16y^2 = 144$

(5 Marks)

b) Determine the equation of the hyperbola with its centre at (-4,1), vertex at (2,1) and semi-conjugate axis 4.

(5 Marks)

c) Find the equation to the tangent and normal to the hyperbola $9x^2 - 4y^2 = 36$ at the point $(4, 3\sqrt{3})$.

(5 Marks)

d) Find the equation to the tangent and normal to the ellipse $5x^2 + 3y^2 = 137$ at the point in the first quadrant whose ordinate is 2.

(5 Marks)

QUESTION FIVE (20 MARKS)

a) Convert the rectangular equation $x^2 + y^2 - 2ax = 0$ to polar form.

(5 Marks)

b) Find the Cartesian equation of $r = a(1 + 2cos\theta)$.

(5 Marks)

c) Find the equation of the tangent and the normal to the parabola $y^2 = 16x$ at the point (16,16) and (1, -4).

(5 Marks)

d) Find the length of the tangent from the point (5,-1) to the circle $\left(x - \frac{1}{2}\right)^2 + y^2 = \frac{25}{4}$

(5 Marks)