KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2008/2009
INSTITUTE OF OPEN LEARNING
EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE
SMA 103: ANALYTIC GEOMETRY

DATE: TUESDAY 16TH FEBRUARY 2016
TIME: 2.00 P.M. – 4.00 P.M.

INSTRUCTIONS
Answer Question ONE and any other TWO Questions.

1. a) Show that line segments joining A(-5, 3), B(6, 0) and C(5,5) form a right triangle. (5 marks)

b) Find the equation of the circle where the points (3, 2) and (-3, 0) are the ends of a diameter. (4 marks)

c) Find the vertex, focus and the equation of the directrix of the parable \(8y = 12 - 4x + x^2\). (6 marks)

d) Determine the equation of the ellipse with vertices at (1, 5) and (1, -1), and foci at (1, 4) and (1, 0). (7 marks)

e) Find the equation of the hyperbola with asymptotes \(x-y=-1\) and \(x+y=-3\) and vertex (3, -1) (4 marks)

f) Find the rectangular equation of each of the given equations

\[\text{i) } r \cos \theta = 4 \] \hspace{1cm} (2 marks)

\[\text{ii) } r^2 = 16 \cos 2\theta \] \hspace{1cm} (2 marks)

2. a) Find an equation of the line with slope 2 and tangent to the circle of radius 5 with centre at the origin. (6 marks)

b) Show that the two circles \(x^2 + y^2 - 3x + 2y - 3 = 0\) and \(x^2 + y^2 + 2x + y - 1 = 0\) are orthogonal. (8 marks)
c) Find the length of a tangent to the circle
\[(x - 2)^2 + (y - 4)^2 = 7\] from (7, 9).

(6 marks)

3. a) Find the equation of the parabola with vertex (-2, -4) and directrix x = 3.

(6 marks)

b) Reduce the following equation of a parabola to standard form; write the coordinates of vertex and focus; write the equations of directrix and axis;

\[y - 3y + 3 = 0\]

hence sketch its graph.

(8 marks)

c) Find the equation of the tangent to \((y - 2)^2 = -3(x + 1)\) with slope 1/2.

(8 marks)

4. a) Find the coordinates of the vertices, foci and centre, equations of the directions of the ellipse.

\[9x^2 - 90x + 25y^2 - 150y + 225 = 0\]

(11 marks)

b) Find the equation of the ellipse with foci at (-2, 1) and (4, 1), and a major axis of 10.

(7 marks)

c) Write the following equation \(x^2 + y^2 = 16\) in polar coordinates.

(2 marks)

5. a) Find the equation of the hyperbola with foci at (1, 2) and (11, 2) with a transverse axis of 8.

(9 marks)

b) Find the centre, foci, vertices, equations of asymptotes, directrices of the hyperbola

\[2x^2 - y^2 - 4x - 4y - 4 = 0\]

Hence sketch its graph.

(11 marks)