JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION 2012/2013

1ST YEAR 1ST SEMESTER EXAMINATION FOR THE DEGREE OF BED (SCIENCE) AND BSC. (ACTUARIAL SCIENCE)

(REGULAR)

COURSE CODE: SMA 101

TITLE: ANALYTICAL GEOMETRY

DATE: 22/4/2013 **TIME: 14.00-16.00PM**

DURATION: 2 HOURS

INSTRUCTIONS

1. **This paper contains SIX (6) questions**
2. **Answer question 1 (Compulsory) and ANY other 2 Questions**
3. **Write all answers in the booklet provided**

QUESTION ONE-30 MARKS (COMPULSORY)

a) Use the third order matrix determinant to determine the equation of a line passing through the points A(1, 1) and B(4, -5) giving your answer in double intercept form. (4 marks)

b) Determine the equation of a plane that passes through the points $A(1,2,0)$, $B(-1,0,1)$ and $C(-2,1,-1)$ (4 marks)

c) Given two parallel lines $4y-3x=-3$ and $4y=3x-28$, determine the distance between them and the equation of a line that passes midway between them. (4 marks)

d) Identify the conics given below (4 marks)

(i) $x^2-4xy+4y^2-24x+12y=0$

(ii) $x^2-2xy+2y^2-25=0$

e) Find the equation of a circle which passes through (6, -5), (2, -7) and (-6, -1) giving your answer in the form $Ax^2+By^2+Cx+Dy+E=0$. Give the equations of four lines that intersect to form the square that circumscribes the circle. (10 marks)

f) Give polar coordinates in two forms for each of the following points, one with positive polar coordinates and another with negative polar coordinates.

i) (-4, 5) ii) (-2,-7) (4 marks)

QUESTION 2 (20 MARKS)

a) The equation of an ellipse is given by $25x^2+36y^2-200x+216y-176=0$

Find on the *xy* plane

i) The centre of the ellipse (4 marks)
ii) The coordinates of the vertices (2 marks)
iii) The foci (2 marks)
iv) The eccentricity (1 mark)
v) The directrices (2 marks)
vi) The area of the ellipse (2 marks)

b) Determine the cartesian equations given that $x=2\sin^{-}$ and $y=3\cos^{-}$ hence sketch the curve on an *xy* plane (3 marks)

c) Sketch the curve $r=\dfrac{6}{2+6\cos^{-}}$ stating and clearly indicating the vertex/vertices and the focus/foci (4 marks)

QUESTION 3(20 MARKS)

a) The equation of a hyperbola is given as $9x^2-36x-4y^2+24y-36=0$. Find

i) The coordinate of the centre. (4 marks)
ii) The foci of the hyperbola on the *xy* plane. (2 marks)
iii) The vertices on the *xy* plane. (2 marks)
iv) The asymptotes on the $x'y'$ plane and on the *xy* plane. (2 marks)
v) The eccentricity (1 mark)
vi) The direcrices on the $x'y'$ plane and on the *xy* plane. (2 marks)

b) A second degree curve is represented by the equation $x^2-2xy+y^2-16x-48y=0$. By eliminating the cross product term identify the conic section hence give its

equation on the $x'y'$ plane and state the equation of the axis.
(7 marks)

QUESTION 4 (20 MARKS)

a) Sketch the polar curve $r = 5\cos^2 \theta$ of each of the following in the range $0^0 \le \theta \le 360^0$ and give its name (7 marks)

b) Given three points A(1,1) , B(-2,4)and C(-3,-1) , Determine the equation of the lines AB and BC hece determine the value of angle ACB (7 marks)

c) Give any two pair of parametric equations which represent the equation $9x^2 - 4y^2 = 36$ (4 marks)

d)Convert the following points into cartesian cordinates

i) $(-5, 30^0)$ ii) $(4, \frac{\pi}{2})$ (2 marks)

QUESTION 5 (20 MARKS)

a) A parabola has the equation $y^2 - x - 4y + 3 = 0$
Determine
i)the coordinates of the vertex (2 marks)
ii) The focus. (2 marks)
iii)The equation of the axis of symmetry (2 marks)
iv)The equation of the directrix (2 marks)

a) The coordinates of two points *A* and *B* are given as *A*(-4, 1) and *B*(2,2), Determine the equation of a line perpendicular to *AB* and divides *AB* in the ratio 4: -1 giving your answer in the form $Ax + By + C = 0$ where *A* and *B* are constants
(4 marks)

b) A hyperbola whose centre is (2, -3) has its foci $\sqrt{13}$ units away from the centre along an axis parallel to the y – axis. If the vertices are 2 units away from the centre, then determine;
(i) The equation of the hyperbola in the form $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$
(4 marks)
(ii) State the equation of the asymptotes . (4 marks)