JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF MATHEMATICS AND ACTUARIAL SCIENCE

UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF EDUCATION SCIENCE/BACHELOR OF SCIENCE(ACTUARIAL SCIENCE WITH IT)
1ST YEAR 1STSEMESTER 2018/2019 ACADEMIC YEAR

MAIN CAMPUS

COURSE CODE: SMA 101
COURSE TITLE: ANALYTIC GEOMETRY

EXAM VENUE: **STREAM:**

DATE: **EXAM SESSION:**

TIME: 2.00 HOURS

Instructions:

1. **Answer question one (compulsory) and any other two questions.**
2. **Candidates are advised not to write on the question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

QUESTION ONE (COMPULSORY 30 MARKS)

a) Define the Conic sections below
   i)Ellipse
   ii) Hyperbola (2 marks)

b) A line L_1 has an equation $y = -2x + 6$. Calculate the acute angle between L_1 and L_2whose equation is $3y + 2y + 6 = 0$ (6 marks)

c) Convert the following polar coordinates in to Cartesian coordinates.
   (i)(-4, 60^0) (ii) $\left(5, \frac{\pi}{2}\right)$ (4 marks)

d) Find the radius of a circle whose area is the same as the area of an ellipse whose equation is $25(x-1)^2 + 16(y+2)^2 = 1$ (4 marks)

e) Calculate the area of a circle which passes through (1, 7), (-16, 0) and (8,0). (Take $\pi = 3.142$) (6 marks)

f) Determine the perpendicular distance between a point (6,-3) and the line $y = 2x + 1$ (4 marks)

g) Use the third order matrix determinant to determine the equation of a line passing through the points (4, 8) and (9, -2) giving your answer in double intercept form, hence declaring the intercepts. (4 marks)

QUESTION TWO (20 MARKS)

a) The Equation of an ellipse is given by $25x^2 + 9y^2 - 150x + 36y + 36 = 0$
   Determine on the *xy* plane
   (i) The centre of the ellipse (2 marks)
   (ii) The vertices (4 marks)
   (ii) The foci (3 marks)
   (iii) The eccentricity (1 mark)
   (v) The equations of the directrices (3 marks)
   (vi) The Equations of the axes of the ellipse (2 marks)

b) Consider the polar curve of a conic section given by $r = \frac{2}{1 - 2\cos\theta}$, sketch the curve hence determine the eccentricity, focus and equation of the directrices of the conic section. (5 marks)

QUESTION THREE (20 MARKS)

a) The equation of a hyperbola $9x^2 - 16y^2 - 36x = 108$ Find
   (i) The centre and axes of the hyperbola (6 marks)
   (ii) The foci (3 marks)

(iii) Eccentricity (1 mark)

(iv) the equations of the directrices of the hyperbola (2 marks)

(v) the equation of the asymptotes of the hyperbola. (4 marks)

b) Determine the pair of parametric equations for the curve $\frac{x^2}{25}-\frac{y^2}{9}=1$ (4 marks)

QUESTION FOUR (20 MARKS)

a) Determine the the distance between two parallell lines $y=4x-6$ and the line $y-4x-8=0$ (4 marks)

b) The equation of a parabola is given by $y^2+8x-4y-4=0$.

(i) What is the equation of the parabola in the form $(y-k)^2=4a(x-h)$, where *k*, *a* and *h* are constants. (4 marks)

(ii) Determine the axis of the parabola (2 marks)

(iii) Determine the focus and vertex of the parabola. (3 marks)

(iv) Find the equation of the directrix and axis of symmetry of the parabola. (2 marks)

(v) Determine the equation of a line parallel to the directrix and passes through the focus. (1 mark)

c) Identify the conic sections given below

(i) $x^2-\sqrt{5}xy+y^2-12x+3y=0$

(ii) $r=\frac{4}{2-\cos\theta}$ (4 marks)

QUESTION FIVE (20 MARKS)

a) Sketch and give the name of the polar curves $r=1+3\cos\theta$ (6 marks)

b) (i) A second degree curve is represented by the equation $4x^2-4xy+y^2+5\sqrt{5}x+5=0$. By eliminating the cross product term give the new equation of the conic section on the new $x'y'$ plane and state the equation of its axis. (8 marks)

(ii) On the new $x'y'$ plane determine the foci and the equation of directrices of the conic section. (6 marks)