MAASAI MARA UNIVERSITY

UNIVERSITY EXAMINATIONS 2018/2019

SCHOOL OF SCIENCE AND INFORMATION SCIENCES

UNIVERSITY EXAMINATIONS FOR THE DEGREE OF
BACHELOR OF SCIENCE (MATHEMATICS, PHYSICS & APPLIED STATISTICS WITH COMPUTING)

FIRST YEAR SECOND SEMESTER EXAMINATION

COURSE CODE: MAT 1205/1208

COURSE TITLE: ANALYTICAL GEOMETRY

DATE: TIME:

Instructions

Answer Question **ONE** and ANY other **TWO** Questions

QUESTION ONE (30 marks) Compulsory

a) Given a quadrilateral with vertices at points (2,1), (7,1), (9,3) and (4,3), Show that the middle points of the diagonals intersect. **5mks**

b) Determine the parametric equations of a line through the point P(-1,4) in the direction of the vector $\overset{.}{v}=<1,2>$.
3mks

c) Show that the equation $x^2 + y^2 - 4x + 10y - 13 = 0$ represents a circle and find its center and radius. **4mks**

d) Find the polar equation of the curve represented by $x^2 + y^2 = 9$. **3mks**

e) Express the rectangular coordinate equation $x^2 + y^2 - z^2 = 1$ in spherical coordinates. **5mks**

f) Show that a curve with polar equation $r = 2\cos\theta$ is a circle, determine its center and radius. **5mks**

g) Find $\dfrac{d^2 y}{dx^2}$ of the parametric equation $y = t^3 - 3t, x = 3t$ **5mks**

QUESTION TWO 20marks

a) Given that l_1 has slope λ, the tangent of the angle from l_1 to l_2 is β, proof that $\dfrac{\lambda + \beta}{1 - \lambda\beta}$ represents equation of the slope of l_2 hence find the equation of the line that passes through the point (2,3) and makes an angle of 110^0 with line $5x + y - 3 = 0$. **10mks**

b) Determine the center and the radius of the circle passing through the points A(4,3) B(0,1) and C(1,0). **10mks**

QUESTION THREE 20marks

a) Find the standard equation of the conic
$9x^2 - 4y^2 - 72x + 8y + 176 = 0$ and sketch it.
10mks

b) Determine whether the planes $x - 3y + 6z = 4$ and
$5x + y - z = 4$ are perpendicular, parallel or neither. Find the
angle of their intersection and the set of parametric
equations for the line of intersection.
10mks

QUESTION FOUR 20marks

a) Find the length of an arch of the cycloid
$x = r(\beta - \sin\beta), y = r(1 - \cos\beta)$ for $0 \le \beta \le 2\pi$.
7mks

b) Determine the length of a parabola with equation $y^2 = x$
from (0,0) to (1,1).
7mks

c) Derive the arc length function of the curve
$y = \frac{1}{3}x^3 + \frac{1}{4x}; x > 0$ starting at $P_0(1, \frac{7}{12})$.
6mks