TECHNICAL UNIVERSITY OF MOMBASA

A Centre of Excellence

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS AND PHYSICS

SEPTEMBER 2018 SERIES EXAMINATION

AMA 4102: GEOMETRY

BSSC, BMCS, BSMF, BSCE, BTCE, BTEE, BSEE, BSME, BTME, BSMD AND BTMD

SPECIAL/ SUPPLIMENTARY EXAMINATIONS

TIME ALLOWED: 2HOURS

INSTRUCTIONTO CANDIDATES:

You should have the following for this examination

- Mathematical tables
- Scientific Calculator

This paper consists of **FIVE** questions

Answer question **ONE (COMPULSORY)** and any other **TWO** questions

Maximum marks for each part of a question are as shown

QUESTION ONE (30 MARKS) COMPULSORY

a. Find the normal distance from the point (1,3) to the line $2x + 3y = 6$ (2 mks)

b. Prove that $\frac{cos^2\theta(1-sec^2\theta)sin\theta}{(1-sin^2\theta)cos\theta tan^2\theta} = -tan\theta$ (3 mks)

c. Find the equation of an ellipse whose vertices are points (-1,2) and (9,2) while eccentricity is $\frac{2}{3}$ (4 mks)

d. Determine the length of a tangent from the point (5,7) to the circle whose equation is $x^2 + y^2 - 4x - 6y + 9 = 0$ (5 mks)

e. If $sinA = \frac{3}{5}$ and $cosB = \frac{15}{17}$ where A is obtuse and B acute, find the exact value of $sin(A + B)$ (4 mks)

f. Find the equations of the two tangents that can be drawn from the point (2,3) to the parabola $y^2 = 4x$ (5 mks)

g. Find k so that the lines $\frac{x+2}{-3} = \frac{2y-1}{2k} = \frac{z+5}{2}$ and $\frac{x}{3k} = \frac{y-5}{1} = \frac{z+3}{-5}$ may be perpendicular to each other. (3 mks)

h. $Sketch\ y = 4cos2x\ from\ x = 0\ to\ x = 360$. and use it to state the amplitude and the period. (4 mks)

QUESTION TWO (20 marks)

a. In a triangular lawn the length of two sides and there included angle are $a = 12m\ b = 10m\ and\ < c = 30^0$, calculate the radius of the circumcircle just touching the corners. (4 mks)

b. Find an equation in the form $ax + by + c = 0$ for a line which passes through the point of intersection of the lines $x - 3y = 4\ and\ 3x + y = 2$ being also perpendicular to the line $4x - 3y - 7 = 0$ (6 mks)

c. Discuss the equation stating all properties of the hyperbola, hence sketch the curves indicating the asymptotes, foci and vertex. (10 mks)

QUESTION THREE (20 marks)

a. Solve the equation $3cos2\theta\ + sin\theta\ = 1$ for values of $0 \leq \theta \leq 360^0$ (6 mks)

b. Find the equations of the line through (1,-2,3) and perpendicular to the plane $2x + y - z = 5$ (7 mks)

c. Give a brief definition about the following terms

   i. Direction ratios (2 mks)

   ii. Direction cosines (2 mks)

d. Give the parameterization of the line joining the points $(2,2,1)$ and $(4,6,6)$ (3 mks)

QUESTION FOUR (20 marks)

a. Plot accurately the graph of the polar equation $r = sin2\theta$ and mark the line of symmetry on the grid. How many lines of symmetry exist in the figure? (7 mks)

b. Solve the equation $12cos^2\theta + sin\theta = 11$ on the domain $0^0 \leq \theta \leq 360^0$ (5 mks)

c. Determine the points of intersection of the line 2y=x+6 and the parabola $y = 8x$ hence find the equations of the tangent and normal lines at these intersection points. (8 mks)

QUESTION FIVE (20 marks)

a. Find the eccentricity and semi latus rectum of the eclipse $4x^2 + 3y^2 = 5$ (5 mks)

b. Determine the equations of the tangent to the circle $x^2 + y^2 - 4x - 2y - 8 = 0$ which is parallel to the line $3x + 2y = 0$ (8 mks)

c. Solve the equation $tan\theta = 2\sin\theta$ (3 mks)

d. Find the magnitude and equations of the shortest distance between the straight line $\frac{x+3}{-4} = \frac{y-6}{3} = \frac{z}{2}$ and $\frac{x+2}{-4} = \frac{y}{1} = \frac{z-7}{1}$ (4 mks)