TECHNICAL UNIVERSITY OF MOMBASA

A Centre of Excellence

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS AND PHYSICS

APRIL 2016 SERIES EXAMINATION

UNIT CODE: AMA 4102 UNIT TITLE: GEOMETRY

SPECIAL/SUPPLIMENTARY EXAMINATION

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 COMPULSORY (30 MARKS)

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

b. Sketch the curves depicting the following equations

$$x = \sqrt{9 - y^2}$$ (3 marks)

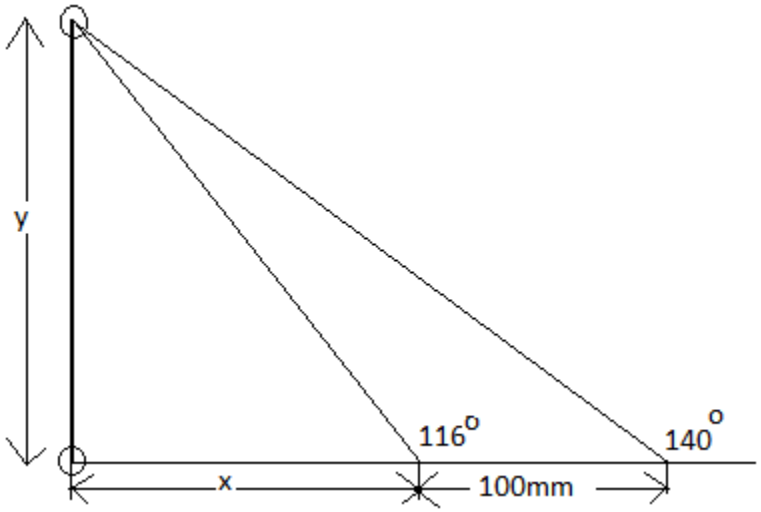
c. y^2A constant force of $F = 10i + 2j - k$ newtons displaces an object from

$A = 10i + 2j - k$ to $B = 2i - j + 3k$ in metres. Find the work done in Newton meters (4 marks)

d. State a vector equation of the line passing through the point P(4, 1) and Q(7, -5) (4 marks)

e. Determine the equation of the tangent to the circle $x^2 + y^2 - 4x - 2y - 8 = 0$which are parallel to the line $3x + 2y = 0$ (5 marks)

f. Calculate correct to 3 significant figures, the coordinates x and y to locate the hole center at P as shown in the figure



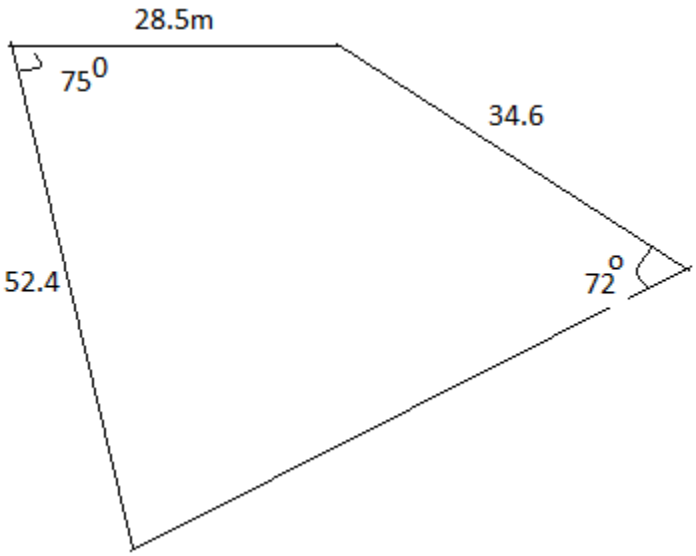
(5 marks)

g. Prove that $\frac{cos^2\theta(1-sec^2\theta)sin\theta}{(1-sin^2\theta)cos\Theta tan^2\theta} = -tan\theta$ (5 marks)

QUESTION TWO (20 MARKS)

a. A building site is in the form of quadrilateral as shown in the figure. If its area is 1510m^2. Determine the perimeter of the site

(4 marks)



b. Find the scalar equation of the straight line with normal (-6, 4) that passes through the point (-3, -7) (4 marks)

c. Neatly draw the graph of $r = 2sin\ 2\theta$ in the range$0 \leq x \leq 360^0$. Hence write the polar equation into Cartesian form (6 marks)

d. Find the eccentricity and the semi latus rectum of the ellipse $2x^2 + 3y^2 = 5$

(6 marks)

QUESTION THREE (20 MARKS)

a. Determine the diameter and circumference of a circle if an arc of length 4.75cm subtends an arc 0.91 rad (2 marks)

b. A line passes through (5, -2) with direction vector(2,6)

   i. State the parametric equations of this line (1 marks)

   ii. What point on the line corresponds to the parameter value t=3

   (1 marks)

   iii. Does the point (1, -8) lie on this line? (3 marks)

   iv. Find the y-intercept and the slope of the line. Then write the equation of the line in the form y= $mx + c$ (3 marks)

c. A line AB is the diameter of a circle such that the coordinates of A nad B are (-1, 1) and (5,-1)n respectively.

   i. Determine the centre and radius of the circle (3 marks)

ii. Find the equation of the circle (2 marks)

d. Solve the equation $12cos^2\theta + sin\theta = 11$ (5 marks)

QUESTION FOUR (20 MARKS)

a. Calculate the resultant of $v_1 - v_2 + v_3$

$V_1 = 22\ units\ \ at\ 140^0$

$V_2 = \ 40\ units\ at\ 190^0$

$V_3 = \ 15\ units\ \ at\ 290^0$ (5 marks)

b. Find the distance from a point s(1, 1, 5) to the line given by
$x = 1 + t$
$y = 3 - t$
$z = 2t$ (5 marks)

c. 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 marks)

d. Find vector *v* joining point P and Q where point P has coordinates (4, -1, 3) and point Q has coordinates (2, 5, 0). Also find $|v|$ (4 marks)

QUESTION FIVE (20 MARKS)

a. (i) Find the equation of a circle center (-2, 3) and radius 4 units (2 marks)
(ii) Find the equation of a line through the point (-1, 3, 4) and perpendicular to the plane
$3x - y - z = 5$ (2 marks)

b. Discuss the equation stating all the properties of the hyperbola
$x^2 - 4y^2 + 2x + 8y - 7 = 0$hence sketch the curve indicating the asymptotes foci and vertex (6 marks)

c. If $sin\ A = \frac{3}{4}$ and $csc\ B = \frac{17}{8}$ where A and B are acute angles, without using mathematical tables or calculator evaluate $\frac{3sinA+2cosA}{secB}$ (5 marks)

d. Four the vector $a = i + 4j - 2k\ and\ b = 2i - j + 3k.$
Find

i. axb (3 marks)

ii. $|axb|$ (2 marks)