ELIZADE UNIVERSITY

ILARA-MOKIN

FACULTY: BASIC AND APPLIED SCIENCES
DEPARTMENT: MATHEMATICS AND COMPUTER SCIENCE
1st **SEMESTER EXAMINATION**
2017 / 2018 **ACADEMIC SESSION**

COURSE CODE: MTH 103

COURSE TITLE: Mathematics III

COURSE LEADER: Dr. A. Adesanya

DURATION: 2 Hours

HOD's SIGNATURE

INSTRUCTION: Candidates should answer any FOUR Questions.

Students are warned that possession of any unauthorized materials in an examination is a serious offence.

Q1. (a) What is the difference between Vector quantity and Scalar quantity?

(b) Classify the following into Vector and Scalar quantities Displacement, Power, Energy, Acceleration, Impulse and Mass.

(c) If $a \ and \ b$ are unit vectors inclined at an angle of 60^0 to each other, find $|a + b|$.

(d) Find the unit vectors, direction cosines and direction angles for $a = 2i + j - 4k$.

Hence prove that $cos^2 \propto + cos^2 \beta + cos^2 \gamma = 1$.

(e) Show that $a \ x c = b \ x c$, $if \ a = b + \lambda c$ for some scalar.

Q2. (a) Define Scalar product.

If $a = 4i + 3j + 7k$ and $b = 2i + 5j + 4k$ find the angle between the vectors.

(b) Find the value of μ if the points $(-1,-1,2)$, $(2,\mu,5)$ and $(3,11,6)$ are collinear.

(c) The position vectors of the points A, R and B are $11i + j$, $5i + \frac{13}{3}j$ and $2i + 6j$ respectively. **(i)** Show that A, R and B lie on a straight line.

(ii) Find the ratio $AR: RB$.

Q3. (a) Which of the lines $y = 4x$, $y = 3x + 2$ and $y = x$ is perpendicular to

$x + 4y + 2 = 0$?Justify your answer.

(b) Find the equation of the line that passes through the point $(1,4)$ and is parallel to

$y = 3x - 2$.

(c) Find the angle between the lines whose slopes are -3 and $\frac{-1}{2}$.

Q4. (a) Show that the equation $4x^2 + 4y^2 - 4x - 12y + 1 = 0$ represents a circle and

find its centre and radius.

(b) Find the equation of the circle which passes through the points $(4,1)$ and $(6,5)$ and has its centre on the line $4x + y = 16$.

Q5. Given the equation of the parabola $x = -y^2 + 8y - 14$

(i)   Write the equation in standard form $x = a(y - k)^2 + h$

(ii)   Find the Vertex, Focus, Directrix and axis of symmetry.

(iii) Graph the parabola.

Q6. (a) Find the Centre, Foci and Vertices of the ellipse $\frac{(x+4)^2}{9} + \frac{(y+2)^2}{4} = 1$.

(b) Find the equation of the ellipse with foci $(0, \pm 8)$ and eccentricity $e - \frac{4}{5}$.

Sketch its graph.