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# KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY

UNIVERSITY EXAMINATION, 2020/2021 ACADEMIC YEAR
FIRST YEAR, FIRST SEMESTER EXAMINATION
FOR THE DEGREE OF BACHELOR OF SCIENCE
(MATHEMATICS)

Date: 14th December, 2020
Time: 11.30am – 1.30pm

## KMA 101 - INTRODUCTION TO ANALYTICAL GEOMETRY

**INSTRUCTIONS TO CANDIDATES**

ANSWER **QUESTION ONE (COMPULSORY)** AND **ANY OTHER TWO** QUESTIONS

**QUESTION ONE (30 MARKS)**

a) Find the equation of the line that passes through the point (4, -3) and making an angle of $60^{\circ}$ with the positive x-axis. (5 Marks)

b) Find the equation of the ellipse whose foci are (3,-1) and (3,7) and vertex at (3,9). (5 Marks)

c) Change $4x^2 - 16x + 4y^2 - 24y + 51 = 0$ to standard form and give the radius of the circle and coordinates of the centre. (5 Marks)

d) Find the acute angle made by the line joining the points (-3,2) and (4,4) and the line joining the points (-2,-1) and (1,2). (5 Marks)

e) Show that $y^2 + 4y + 8x - 4 = 0$ is an equation of a parabola and sketch it. (5 Marks)

f) Find the equation of the sphere with center (1,0,2) and passes through the point (2,4,6). (5 Marks)

**QUESTION TWO (20 MARKS)**

a) Find the equation of the circle that passes through the points (2,1), (0,5) and (-1,2) and hence find the center and radius of the circle. (8 Marks)

b) Show that $x^2 + y^2 + 18x + 14y + 105 = 0$ is an equation of a circle. Find the center and radius of the circle. (7 Marks)

c) Find the equation of the circle whose center is at the point (-1,-3) and radius is 5. (5 Marks)

**QUESTION THREE (20 MARKS)**

a) Find an equation of the ellipse whose foci are (2,-1) and (2,7) and whose major axis has length 12, hence sketch the ellipse. (7 Marks)

b) i) Show that $9x^2 - 18x + 4y^2 + 16y - 11 = 0$ is an equation of an ellipse. (3 Marks)

Hence find:

ii) The lengths of the semi-major and semi-minor and coordinates of the vertices. (3 Marks)

iii) Coordinates of the foci (3 Marks)

iv) The length and coordinates of the latera recta (3 Marks)

v) The eccentricity (1 Mark)

**QUESTION FOUR (20 MARKS)**

a) Find an equation of the sphere which passes through $(1,-3,4),(1,-3,0),(1,-5,2)$ and has got its center on the plane $x + y + z = 0$. (5 Marks)

b) Show that $3x^2 - 2x + 3y^2 - 2y + 3z^2 - 4z - 22 = 0$ is an equation of a sphere and hence find its centre and radius. (5 Marks)

c) Find the equation of the plane passing through the points (1,1,1), (1,2,0) and (-1,2,1). (5 Marks)

d) Determine the ratio in which the line 2x+y-4=0 divides the line segment joining the points A (2,-2) and B(3,7). (5 Marks)

**QUESTION FIVE (20 MARKS)**

Given the equation $4x^2 - 32x - y^2 - 4y + 24 = 0$, find;

i) The lengths of the semi-major and semi-minor and coordinates of the vertices. (5 Marks)

ii) Coordinates of the foci (4 Marks)

iii) The length and coordinates of the latera recta (5 Marks)

iv) The equations of the assymptotes (3 Marks)

v) Sketch the curve (3 Marks)