

Mount Kenya



University

UNIVERSITY EXAMINATION 2014/2015

**SCHOOL OF PURE AND APPLIED SCIENCES
DEPARTMENT OF MATHEMATICS, STATISTICS AND ACTUARIAL SCIENCES**

**BSNE/BEDS/BEDA
SCHOOL BASED**

UNIT CODE: BMA1208

UNIT TITLE: ANALYTICAL GEOMETRY

DATE: APRIL/MAY 2015

MAIN EXAM

TIME: 2 HOURS

INSTRUCTIONS: Answer question one and any other two

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

1. a). The line GH with coordinates $G(7,5)$ and $H(9,7)$ is the diameter of a circle.
Find
 - i. The coordinates of the centre of the circle. (2mks)
 - ii. The equation of the circle. (5mks)
 - iii. The equation of the tangent to the circle at point H (4mks)
- b). Sketch the parabola with equation $x^2 + 2x + 4y - 3 = 0$ clearly indicating the vertex and the focus. (5mks)
- c). Determine the equation of the ellipse that has major axis of length 8 along the y -axis, minor axis of length 4 along the line $x = -1$ (4mks)
- d). Find the equation of the line that passes through the point $(1,2)$ and the intersection of the lines $x + 2y = 3$ and $2x - 3y = -1$ (5mks)
- e). A hyperbola has one focus F' at $(-2,3)$. The corresponding directrix is the line $x = 3$. Find the coordinates of V' (3mks)
- f) Convert $(3,5)$ into polar coordinates (2mks)

2. a). An ellipse has equation $3x^2 + 6y^2 - 48x + 36y + 222 = 0$. Determine
- the coordinates of the centre, foci, and vertices,
 - the length of the major and minor axis
 - Equation of tangent to the ellipse at point $(8, -5)$ (10 mks)

b). Find the equation of the circle that passes through the points $(2,3), (3,2)$ and $(-4,3)$ (7mks)

C). Convert $x^2 + (y-3)^2$ into a polar equation. (3mks)

3. a). A hyperbola has equation $2x^2 - 3y^2 + 16x - 6y + 7 = 0$.Find

- The coordinates of the centre, and vertices
- Find the equation of the asymptotes
- Sketch the curve (10 Mks)

b). Write a polar equation of the parabola with focus at origin and directrix $y=2$. (6mks)

c). Show whether the circles $x^2 + y^2 - 4x - 6y + 9 = 0$ and $x^2 + y^2 + 6x - 2y - 26 = 0$ are orthogonal (4mks)

4. a) Determine the equation of the tangents at the end points of the latus rectum of the parabola with equation $x^2 + 2x + 4y + 15 = 0$ (10mks)

b) Given the lines $3x - 2y = 6$ and $x - 3y = -5$ find the size of the angle between the two lines. (6 Mks)

c) Express

i. $(4, -4)$ in polar coordinates (2mks)

ii. $r = \frac{4}{1 + 2\sin\theta}$ as a Cartesian equation. (2mks)

5. a) The triangle PQR has vertices $P(6, -2), Q(4, 3)$ and $R(-1, -1)$. Find
- The coordinates of the point T which divides the line PQ in the ratio $3:2$ (4mks)
 - The distance from the point T to the line PR (4mks)

b) Find

- i. The length of the tangent to the circle $x^2 + y^2 - 4x - 8y = 5$ from the point $(8, 2)$ (6mks)
- ii. Determine whether the point $(2, -3)$ lies in, on or outside the circle (6 mks)