



MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

FIRST SEMESTER EXAMINATION FOR DEGREE IN BACHELOR OF EDUCATION
(ARTS)

SMA 103: ANALYTICAL GEOMETRY

Date: SCHOOLBASED

Time:

INSTRUCTIONS:

Answer Question one and any other two questions

SECTION A

QUESTION ONE [30 MARKS]

- a) Convert the polar coordinates of the point $(6, 137^\circ)$ into Cartesian coordinates (4 marks)
- b) Prove that $\tan 2\theta = \frac{2\tan \theta}{1-\tan^2 \theta}$ (4 marks)
- c) Find the distance between the points $(2,1)$ and $(-3,8)$. (2 marks)
- d) Find the gradient of the line passing through the points $(3,7)$ and $(-1,23)$ (3 marks)
- e) Find the distance from point $P(-2, -3)$ to the line $8x + 15y - 24 = 0$. (4 marks)
- f) Determine the radius and the coordinates of the circle given by the equation
$$x^2 + y^2 - 8x - 2y + 8 = 0$$
 (5 marks)

g) Find the focus of the equation of the directrix, the length of the latus rectum for the parabola $5y^2 = 24x$ (5 marks)

h) Find the normal equation of the line with $p = 8$ and $w = 30$ (3 marks)

SECTION B: ANSWER ANY OTHER TWO QUESTIONS

QUESTION TWO [20MKS]

a) Find the coordinate of the foci, the eccentricity, the length of the latus rectum and the direction of the hyperbola

$$\frac{x^2}{36} - \frac{y^2}{4} = 1 \quad (8 \text{ marks})$$

b) Sketch the circle given by the equation $x^2 + y^2 - 4x + 6y - 3 = 0$ (6 marks)

c) Prove that $\frac{\tan x + \sec x}{\sec x(1 + \tan x / \sec x)} = 1$ (6 marks)

QUESTION THREE[20MKS]

a) Find the directrix, eccentricity & foci of the ellipse $4x^2 + 9y^2 = 36$. Hence sketch a graph (8 marks)

b) Solve the equation in the range $-180^\circ \leq x \leq 360^\circ$ (6 marks)

$$\cos\left(\frac{x}{2}\right) - 2\sin^2\left(\frac{x}{2}\right) = -1$$

c) Solve $6\cos^2\theta + 5\cos\theta - 6 = 0$ for values of θ in the range $0^\circ \leq \theta \leq 360^\circ$ (6 marks)

QUESTION FOUR [20MKS]

a) Find the general and normal equations to the line through points (2,5) and (3,7) (8 marks)

b) Evaluate the following expression correct to 4 significant figures

$$\frac{4 \sec 32^\circ 10' - 2 \cot 15^\circ 19'}{3 \operatorname{cosec} 63^\circ 8' \tan 14^\circ 57'} \quad (4 \text{ marks})$$

- d) A triangle ABC has sides $a = 9.0\text{cm}$, $b = 7.5\text{cm}$ and $c=6.5\text{cm}$. Determine its three angles and its area (4 marks)
- e) Prove that $\tan 2\theta = \frac{2\tan \theta}{1-\tan^2 \theta}$ (4 marks)

QUESTION FIVE [20MKS]

- a) Find the angle between the lines $y = 2x + 5$ and $y = 12x - 1$ (4marks)
- b) Find the focus, the Centre, the eccentricity and directrix of the ellipse whose equation is $x^2 + 4y^2 + 4x - 24y + 24 = 0$ (7 marks)
- c) A circle has the equation $x^2 + y^2 - 4x + 10y = 8$. Find the equation of the tangent and the normal at (3,1). (5 marks)
- d) Find the equation of a parabola whose focus is (2,0) and the directrix is $x = 2$ (4 marks)