



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR THE BACHELOR OF SCIENCE IN
BUILDING & CIVIL ENGINEERING

SMA 2171: GEOMETRY

END OF SEMESTER EXAMINATION

SERIES: APRIL 2013

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- Answer Booklet

This paper consist of **FIVE** questions in **TWO** sections **A & B**

Answer question **ONE (COMPULSORY)** and any other **TWO** questions

Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

SECTION A (COMPULSORY)

Question One

a) (i) Find all solution of $2 \cos x + \sin 2x = 0$ (3 marks)

(ii) Express $\frac{\sin 3x}{\sin x}$ in terms of $\sin x$ (4 marks)

b) (i) Find the acute angle between two lines that have $m_1 = 3$ and $m_2 = 7$ for their slopes. (3 marks)

(ii) Find the distance from the point (5, 2) to the line $3x - y + 6 = 0$ (3 marks)

- c) (i) Find the equation of the curve that is locus of all points equidistant from the line $x = -4$ and point $(3, 4)$ **(5 marks)**

$$y^2 - 6y - 8x + 1 = 0$$

- (ii) Reduce the equation: to standard form **(2 marks)**

$$\frac{\sec \theta}{1 + \cos \theta} = \csc^2(\sec \theta - 1)$$

- d) Prove **(3 marks)**

- e) Determine the end points of the major and minor axes and the foci of the ellipse with equation $25x^2 + 9y^2 = 225$

(6 marks)

SECTION B (Answer any TWO questions from this section)

Question Two

- a) Change the following equation to an equation in rectangular co-ordinates:

$$\phi = \frac{3}{\sin \theta - 3 \cos \theta}$$

(3 marks)

$$2 \sec^2 \theta = 3(2 \tan \theta)$$

- b) Solve the equation **(8 marks)**

- c) ABC is a triangle such that $AB = 12$ cm, $BC = 21$ cm and $\angle B = 101^\circ$. **(9 marks)**

Question Three

- a) (i) Sketch the graph of $y = 1 + \cos x$ for $0 \leq x \leq 2\pi$ **(6 marks)**

- (ii) Find the Amplitude; period and phase shift of $y = 3 \cos(2x - \pi)$ **(3 marks)**

- b) Find the Foci, directrices, eccentricity, length of the focal chord and the equation of the asymptotes of the hyperbola described by the equation:

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

(11 marks)

Question Four

- a) Determine the vertex, the axis of symmetry, the focus and the directrix of the parabola with equation:

$$(y-3)^2 = 8(x-2)$$

. Then graph it.

(7 marks)

- b) Prove the identity:

$$\frac{\cot^2 \theta}{1 + \csc \theta} = \frac{1 - \sin \theta}{\sin \theta}$$

(4 marks)

- c) Graph $r = 2 + 2 \cos \theta$ for $0 \leq \theta \leq 2\pi$

(9 marks)

Question Five

- a) Find the equation of the circle that passes through the points (1, 1), (2,2) and (3, 3). **(8 marks)**

- b) Find an equation of the tangent line and normal line to the hyperbola with equation:

$$\frac{x^2}{9} - \frac{y^2}{16} = 1 \quad P\left(\frac{15}{4}, 3\right)$$

at

(7 marks)

- c) In Washington DC there is a park called Ellipse located between white house and Washington monument. The park is surrounded by a path that forms axis 1502 ft and minor axis having a length of 1280ft. Suppose the part manager wants to install water fountains at fixed points. Find the distance between the fountains rounded to the nearest feet. **(5 marks)**