



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)
Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

CERTIFICATE IN CONSTRUCTION TECHNICIAN II

AMA 1110: GEOMETRY II

END OF SEMESTER EXAMINATION

SERIES: APRIL 2012

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*
- *Mathematical tables*
- *Calculator*

This paper consists of **FIVE** questions in **TWO** sections **I & II**.

Answer question **ONE (COMPULSORY)** plus any other **TWO** questions.

Maximum marks for each part of a question are clearly shown

This paper consists of **FOUR** printed pages

SECTION I (COMPULSORY)

Question 1 (20 marks)

a) In figure 1 below calculate:

(i) The length of the arc ACB (2 marks)

(ii) The area of segment ACB (5 marks)

Figure 1

b) A cone of base radius 7cm and height 15cm is held upside down and filled with water. How much water does it hold when full? (2 marks)

What is the minimum area of plate that would make the cone? (4 marks)

c) Express the following Cartesian equations in polar form

$$y^2 = 8x$$

(i) (1 mark)

$$x^2 + y^2 = 4x$$

(ii) (2 marks)

d) Express in Cartesian form

$$r = 3$$

i) (2 marks)

$$r = \cos \theta$$

ii) (2 marks)

$$a = \begin{pmatrix} 1 \\ 1 \\ 3 \end{pmatrix} \quad b = \begin{pmatrix} -2 \\ 1 \\ 1 \end{pmatrix}$$

e) If \tilde{a} and \tilde{b}

$$\tilde{a} + \tilde{b}$$

Find (i) (1 mark)

$$\tilde{a} + 2\tilde{b}$$

(ii) (1 mark)

(iii) $\left| \begin{matrix} a \\ \sim \end{matrix} \right|$ (2 marks)

f) Simplify as much as possible

$$3i \times j$$

(i) (2 marks)

$$2i \times (i + j + k)$$

(ii) (2 marks)

g) Given that $a = 2i + j + 5k$ and $b = 3i + 5j + 7k$. Find $\frac{a \cdot b}{\sim \sim}$ (2 marks)

SECTION II (Attempt any TWO questions)

Question 2 (20 marks)

a) A graph has the equation $R = 4 \cos 2t$.

(i) Complete the table (4 marks)

t°	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210
$2t$															
R															

(ii) Draw the polar graph for $R = 4 \cos 2t$ (4 marks)

b) An ellipse has an equation $9x^2 + 5y^2 = 45$. Find the

(i) Foci (3 marks)

(ii) x and y intercepts (3 marks)

(iii) Sketch the ellipse (6 marks)

Question 3 (20 marks)

a) State the gradient and the y-intercepts of

$$3x + 5y = 7$$

(i)

$$4x - 7y = 7$$

(ii)

(6 marks)

b) (i) Find the equation of a line passing through the point (4,3) and perpendicular to line

$$2x - 5y = 1$$

(5 marks)

(ii) Find the equation of line passing through (-1, 4) and (5, -2)

(4 marks)

- c) From a straight line graph of R and F, these points were selected.
 R = 85 when F = 39
 R = 45 where F = 23.

If the law of the line $F = mR + C$, find the value of m and c (5 marks)

Question 4 (20 marks)

A tapered roller shown below is 35mm long. Its larger diameter is 40mm and its smaller diameter is 30mm.

Figure 2

Question 5 (20 marks)

- a) Points P and Q have position vectors $3i - 3k$ and $i + 2j - 7k$ respectively. Find

(i) $\vec{OP} \cdot \vec{OQ}$ (3 marks)

(ii) $OP \times OQ$ (4 marks)

(iii) Area of triangle OPQ (3 marks)

b) Calculate the volume of a rectangular based frustum of a pyramid whose base is 12 cm by 9 cm, top 4cm by 3 cm and height of 8cm (10 marks)