



# THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

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

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

**CONSTRUCTION TECHNICIAN PART II**

AMA 1102: GEOMETRY II

**END OF SEMESTER EXAMINATION**

SERIES: DECEMBER 2011

**TIME: 2 HOURS**

## **Instructions to Candidates:**

You should have the following for this examination

- *Answer Booklet*
- *Scientific Calculator/Mathematical Tables*

This paper consists of **FIVE** questions

Answer question **ONE (COMPULSORY)** from **SECTION A** and any other **TWO** questions from **SECTION B**

Maximum marks for each part of a question are clearly shown

This paper consists of **THREE** printed pages

## SECTION A (COMPULSORY)

### Question 1 (30 marks)

$$(\cot \theta + \operatorname{cosec} \theta)^2 = \frac{1 + \cos \theta}{1 - \cos \theta}$$

- a) Prove that (5 marks)
- b) Solve the equation  $2 \sec^2 x - \tan x = 3$  for  $0 \leq \theta \leq 360^\circ$  (6 marks)
- c) Measurements of a plot are as shown in figure 1

Fig 1

Determine:

- (i) The fourth side
- (ii) Area of the plot (9 marks)
- d) A surveyor is at some distance at point A north of a tower. He finds the angle of elevation to the top of the tower to be  $30^\circ$ . He then moves 100m to point B  $N60^\circ E$  and finds the angle of elevation to the top of the tower to be  $20^\circ$ . find:
- (i) Height of the tower
- (ii) Bearing of the foot of the tower from point B (10 marks)

## SECTION B (Answer any TWO questions from this section)

### Question 2

- a) Solve the equation  $2 \sin x + \cos x = 0.5$  using the half angle formula (8 marks)
- b) A tower 70m high stands on a cliff on the bank of a lake. The angle of depression to a boat on the lake is  $20^\circ$ . The angle of depression to the boat from the foot of the tower is  $20^\circ$ . Calculate;

- (i) The height of the cliff
  - (ii) The distance of the boat from the cliff
- (12 marks)

**Question 3 (20 marks)**

- a) Solve the equation  $\cos 2x + \cos x = 1$  for  $0 \leq x \leq 360^\circ$  (7 marks)

$$\cot^2\left(\frac{90 - \theta}{2}\right) = \frac{1 + \sin \theta}{1 - \sin \theta}$$

- b) Prove that (5 marks)

- c) The roof of a Church is 20m from the ground. The angle of elevation from the roof to a point on the top of a tower was found to be  $15^\circ$ . Similarly, the angle of elevation to the same point on the top of the tower was  $30^\circ$  when measured from a window 6m below the roof. Calculate the height of the tower. (8 marks)

**Question 4 (20 marks)**

$$r^2 = p^2 + q^2 - 2pq \cos R$$

- a) Show that for triangle PQR of sides  $r, p$  and  $q$ . (7 marks)

- b) A surveyor is 50m N  $30^\circ$ W at station P away from the foot of a tower. He then moves 100m to station Q, N $50^\circ$ E. Calculate:

- (i) The height of the tower
  - (ii) The bearing of the foot of the tower from station Q
- (13 marks)

**Question 5 (20 marks)**

$$\sin(A + B) = \sin A \cos B + \cos A \sin B$$

- a) Show that . Using triangle PQR (7 marks)

$$\sin \theta = 0.2 \cos \theta \quad 0^\circ \leq \theta < 360^\circ$$

- b) Solve the equation for (5 marks)

- c) Station P is 100m from the foot of the tower that is due north of the station. The ground is sloping towards station P at  $15^\circ$  to the horizontal. The angle of elevation to the top of the tower from station P is  $22^\circ$ . calculate the height of the tower (8 marks)