THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

Faculty of Engineering & Technology

DEPARTMENT OF CIVIL AND BUILDING ENGINEERING

CERTIFICATE IN ARCHITECTURE

SEMESTER I EXAMINATIONS

APRIL/MAY 2010 SERIES

GEOMETRY I

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
Answer question **ONE** and any other **TWO** Questions.
Maximum marks for each part of a question are as shown.

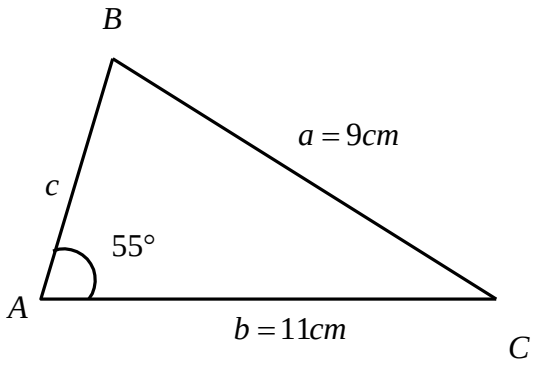
Question ONE

(a). A man north of a tower measures the angle of elevation to the top as 18º. He then moves 108m on a bearing of N65ºE to another station from which angle of elevation is 25º. Determine:-

(i). height of the tower
(ii). angle of elevation at a distance 180m from the tower.

(Assume a level ground) **(17 Marks)**

(b). Using the figure below,



Determine;

(i). $\angle ACB$
(ii). $\angle ABC$
(iii). C **(8 Marks)**

(c). Prove that, $\dfrac{1+\tan^2 A}{1-\tan^2 A} = Sec2A$ **(5 Marks)**

Question TWO

(a). Prove the following identities:-

(i). $\dfrac{\sin^3 A+\cos^3 A}{\sin A+\cos A}+\dfrac{\sin^3 A-\cos^3 A}{\sin A-\cos A}=2$

(ii). $\cos\left(\pi/3+\theta\right)-\cos\left(\pi/3-\theta\right)=-\sqrt{3}\sin\theta$ **(7 Marks)**

(b). (i). Without using tables or calculators, find $\tan(A-B)$.
Given $\sin A = 2/5$ and $\cos B = 6/13$. **(6 Marks)**

(ii). An architect sitting in his office 14m from the ground observes a building at an angle of elevation of 12^{o}. Distance between the two buildings is 110m. Determine height of the building. **(7 Marks)**

Question THREE

(a). Given, $f(t) = 4\sin(t + 30°)$. Draw a graph of $f(t)$, $0° \le t \le 360°$. Determine:

(i). Amplitude
(ii). Period
(iii). Frequency

(12 Marks)

(b). A ladder 35.4 ft long is leaning against an embarkment inclined 62.5° to the horizontal. If the bottom of the ladder is 10.2ft from the embarkement, what is the distance from the top of the ladder down the embarkement to the ground? **(8 Marks)**

Question FOUR

(a). A picture w feet high is placed on a wall with its base, Ƶ feet above the level of the eye of an observer. If the observer is (x) feet from the wall and θ is the angle subtended at observer's eye by the picture. Show that:

$$\theta = \cot^{-1}\left(\frac{x}{\omega + Ƶ}\right) - \cot^{-1}\left(\frac{x}{Ƶ}\right)$$ **(6 Marks)**

(b). Draw one cycle of the function defined by $y = Cos\frac{2}{3}\ t$.

(i.e. $0° \le \times \le 360°$). Hence, evaluate:-

(i). Amplitude
(ii). Period of the function

(10 Marks)

Question FIVE

(a). (i). Solve the equation,

$$2\sin^2 t - \cos t - 1 = 0 \quad , \quad 0 \le t \le 2\pi$$

(7½ Marks)

(ii). Find solution of the equation;

$$2\sin 3\theta \cos\theta = 0 \quad if \quad 0° \le \theta \le 360°$$ **(7½ Marks)**

(b). Obtain an identity for $\tan 4\theta$ in terms of $\tan\theta$. **(5 Marks)**