



TECHNICAL UNIVERSITY OF MOMBASA
Faculty of Applied & Health
Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS
CERTIFICATE IN BUILDING & CIVIL ENGINEERING (CBCE)

AMA 1102: GEOMETRY

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2013

TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Mathematical tables*
- *Scientific Calculator*

This paper consist of **FIVE** questions

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

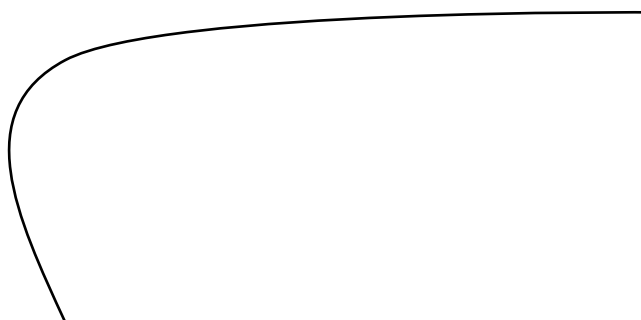
Question One (Compulsory)

a) Explain the meaning of the following angles:

- (i) Complementary angles
- (ii) Reflex angles
- (iii) Acute angles

(3 marks)

b) The figure below shows a circle ABCDE. The line FEG is a tangent to the circle at point E. Line DE is parallel to CG, $\angle DEC = 28^\circ$ and $\angle AGE = 32^\circ$.



Calculate $\angle AEG$ and $\angle ABC$

(4 marks)

c) Calculate the height of a tree of a person is 1.84m tall and is standing 16m away from the foot of the tree, if the angle of elevation from his eye is 20°

(3 marks)

d) A pyramidal frustum has a square top and bottom with lengths 6cm and 10cm respectively. The slant height of the frustum is 12cm. If the frustum is open at both ends, calculate the surface area.

(4 marks)

e) Calculate all the angles in a triangle whose length are 5.5cm, 4.2cm and 3.8cm

(4 marks)

$$x^\circ, (2x - 50^\circ), 2x, (2x - 10), (x + 40)$$

f) A pentagon has the following interior angles

, calculate:

- (i) The value of x
- (ii) All the interior angles
- (iii) All the exterior angles

(4 marks)

(4 marks)

(4 marks)

Question Two

$$\theta \quad 0 \leq \theta \leq 360^\circ \quad 2 \sin^2 2\theta + \sin 2\theta - 1 = 0$$

a) Solve for θ such that and

(5 marks)

b) For the following trigonometric graphs, state the wave length amplitude and phase angle.

$$Y = -\sin(3x + 60^\circ)$$

(i)

(2 marks)

$$Y = \sin\left(\frac{1}{2}x + 10^\circ\right)$$

(ii)

(2 marks)

$$y = 3\cos(x + 40^\circ)$$

(iii)

- c) A stool is made by shaping a tree stump into a conical frustum of vertical height 60cm. If the top radius is 12cm and the bottom one is 24cm, calculate the surface area of the stool. (Take $\pi = 3.142$)
(9 marks)

Question Three

- a) Draw a triangle ABC with AB=BC = 5.4cm. AC = 6.8cm. Draw the inscribed circle for triangle ABC and measure its radius. (8 marks)

$$AB = \begin{pmatrix} 2 \\ 3 \end{pmatrix} \quad BC = \begin{pmatrix} -2 \\ 4 \end{pmatrix}$$

- d) Given that vectors $AB + BC$ and BC find:

(i)

(2 marks)

$$\frac{1}{2}BC$$

(ii)

(2 marks)

$$-2AB$$

(iii)

(2 marks)

Question Four

$$u = 3i - 2j \quad v = -i + j$$

- a) Let $u + v$ obtain:

(i)

(2 marks)

$$2u + v$$

(ii)

(2 marks)

$$u - 3v$$

(iii)

(2 marks)

$$ai + vj$$

Leaving your answer in the form

$$u = v \quad u = hi + 2i - j + 4k + k \quad v_2 = 5i - j + 6k$$

- b) If $u = v$ and $u = hi + 2i - j + 4k + k$ $v_2 = 5i - j + 6k$ where h and k are constant. Calculate the values of h and l (3 marks)

- c) PQRS is a trapezium where PQ is parallel to SR, PR and SQ intersect at X so that SX = KSQ and R PX = hPR where k and h are constant vector PQ = 3q and PS = s SR = q.

(i) Show this information on a diagram (2 marks)

(ii) Express SQ in terms of s and q (2 marks)

(iii) Express SX in terms of s and q and s (2 marks)

(iv) Obtain h and k (2 marks)

d) Find the frequency wavelength, amplitude and phase angle of:
 $y = \sin(t - 30)$

(3 marks)

Question Five

a) Use successive transformation to obtain the image of M (4, 9) under R, a rotation 270° center (0, 0) followed by L a reflection through line $y = 0$. If A is the matrix of R and B matrix of L show that $(BA)M = M^1$ (8 marks)

b) Solve for θ given that
 $\sin \theta = \cos 15^\circ$

(i) $\sin(\theta + 20^\circ) = \cos(3\theta + 30^\circ)$

(ii) $\sin \theta = \cos \theta$

(iii) (6 marks)

c) Rashid starts from point P and walks 5km eastwards then 8km northwards. How far and what is the bearing of his new position from the starting point. (6 marks)