



TECHNICAL UNIVERSITY OF MOMBASA
Faculty of Applied & Health
Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

UPGRADING MATHEMATICS

AMA 1002: GEOMETRY

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2014

TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

This paper consist of **FIVE** questions

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

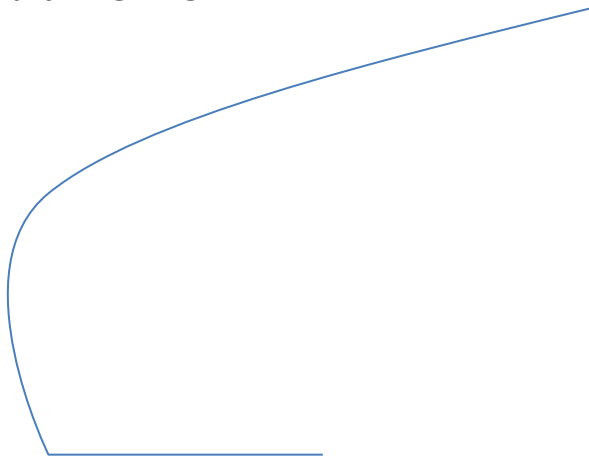
Maximum marks for each part of a question are as shown
 This paper consists of **FOUR** printed pages

Question One (Compulsory)

a) With the aid of sketches, explain the following angles:

- (i) Complementary angles
 - (ii) Reflex angles
 - (iii) Supplementary
- (3 marks)**

b) The figure below shows a circle ABCDE. The line FEG is a tangent to the circle at a 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) (i) Calculate the height of a tree if 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)

(ii) Calculate all the angles in a triangle whose lengths are 5.5cm, 4.2cm and 3.8cm.

(4 marks)

d) A pyramid frustum has a square top and bottom with lengths of 6cm and 10cm respectively. The slant height of the frustum is open on both ends. Calculate its surface area.

(6 marks)

$$u = hi + 3i - j + 4k + 1k, \quad v = 5i - j + 6k$$

e) (I) If $u = v$ and values of h and l .

where h and k are constant. Calculate the

(3 marks)

(II) Fatuma walks on a bearing of 120° from 5km then on a bearing of 200° for 7km. Calculate:

(i) How far she is from the starting point

(ii) The bearing of the starting position from her final position

(5 marks)

f) A pentagon has the following interior angles x_1 .

$$x_1(2x - 50)^\circ, (x + 40)^\circ, 2x, (2x - 10)$$

. Calculate the value of **(2 marks)**

Question Two

a) For the following trigonometric equations, state the wavelength 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) (2 marks)

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

b) Solve for θ such that and (5 marks)

c) A stool is made by shaping a slump 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) Construct ABC in which AB = 4.5cm, BC = 6.5cm and AC = 7.5cm. Construct an escribed circle opposite to $\angle BAC$. Measure the radius of the circle. (7 marks)

b) Two town N and M are such that M (20°N, 30°E) and N(20°N, 120°E) take the earth's radius to be

$$\pi = \frac{22}{7}$$

6370km and

(i) Calculate in kilometers the shortest distance between M and N along the same latitude

(ii) If the time at N is 0935h what is it at M? (6 marks)

c) In the figure below, PQ = q and PR = r QM: MR 1:2 or M divides QR in the ratio 1:2. The point S is the midpoint of PQ. X is the intersection of PM and SR SX = hSR. PX = kPM where h and k are constant.

r

Find:

(i) QR in terms of q and r

(ii) PM in terms of q and r

(iii) SR in terms of q and r

(7 marks)

Question Four

a) Let A(2,8) B(3,5) C(1,3) D(0,6) be coordinates of the quadrilateral ABCD. Suppose that T is the

$$\begin{pmatrix} -1 \\ 2 \end{pmatrix}$$

translation with vector $\begin{pmatrix} -1 \\ 2 \end{pmatrix}$, R is the rotation centre (0, 0), 90° anticlockwise and L is the reflection on the line $y = x$. What is the image of ABCD after translation T followed by rotation R and the reflection L? **(9 marks)**

b) In the figure below, K, L, M and N are points on the circumference of a circle with centre O. The points K, O, M and P are on a straight line, PN is a tangent to the circle at N, $\angle KOL = 130^\circ$ and $\angle MKN = 40^\circ$.

P

Find the values of the following angles, stating the reasons in each case:

- (i) $\angle MLN$
- (ii) $\angle MNP$
- (iii) $\angle OLN$
- (iv) $\angle MPN$

(8 marks)

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

c) Given that vectors $AB = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ and $BC = \begin{pmatrix} -2 \\ 4 \end{pmatrix}$ work out:

- (i) $AB + BC$
- (ii) $\frac{1}{2} BC$
- (iii) $AB - 2BC$

(3 marks)

Question Five

a) Convert the following angles into radians:

- (i) 10°
- (ii) 180°
- (iii) 270°

(3 marks)

b) Derive the following identities:

$$\sin^2 x + \cos^2 x = 1$$

(i) **(3 marks)**

$$\cot^2 \theta - 1 = \operatorname{cosec}^2 \theta$$

(ii) **(3 marks)**

c) Calculate the values of x and y in the figure below given QK is parallel to ST. **(4 marks)**

x

d) Find the number of sides of:

- (i) A polygon having sum of interior angles 1080°
- (ii) A regular polygon if each exterior angle is 24°

(5 marks)