TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

CERTIFICATE (UPGRADING MATHEMATICS)

AMA 1102: GEOMETRY

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: OCTOBER 2013
TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

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

This paper consist of **FIVE** questions in **TWO** sections **A** & **B**
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

SECTION A (COMPULSORY)

Question One

a) With the aid of sketches, explain the following angles:
(i) complementary angles
(ii) reflex angles
(iii) supplementary angles **(3 marks)**

b) The figure below shows a circle ABCDE. The line FEG is a tangent to the circle at a pint E line DE is parallel to CG, <DEC = 28^o and <AGE = 32^o

G

calculate <AEG and <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^o **(3 marks)**

(ii) Calculate all the angles in a triangle whose lengths are 5.5cm; 42cm and 3.8cm **(4 marks)**

d) A pyramid frustrum has a square top and bottom with lengths of 6cm and 10cm respectively. The slant height of the frustrum is Jan open and in both ends. Calculate its surface area. **(5 marks)**

SECTION B (Answer any TWO questions from this section)

Question Two

a) For the following trigonometric equations, state the wavelength amplitude and phase angle:

$$y = -\sin\left(3x + 60^o\right)$$

(i)

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

(ii)

$Y = 3\cos\left(x + 40^{0}\right)$

(iii) **(6 marks)**

b) Solve for θ such that $0 \le \theta \le 360^{o}$ and $2\sin^{2} 2\theta + \sin 2\theta - 1 = 0$ **(5 marks)**

c) A stool is made by shaping a stump into a conical frustrum of vertical height 60cm. If the top radius is 12cm and the bottom one is 24cm. Calculate the surface are 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 <ABC. Measure the radius of the circle **(7 marks)**

b) Two towns N and M are such that M(20°N, 30°E) and N(20°N, 120°E) take the earth's radius to be 6370km and $\pi = \frac{22}{7}$

(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, $PQ = q$ e 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 constants:

X

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 translation with vectors $\begin{pmatrix} -1 \\ 2 \end{pmatrix}$, R is the rotation center (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 pints 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, <1<OL = 130° and <MKN = 40°

O

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

(i) <MLN
(ii) <MNP
(iii) <OLN
(iv) <MPN **(8 marks)**

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

c) Given that vectors and work out:

(i) AB + BC
(ii) ½ 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:

(i) $\sin^2 x + \cos^2 x = 1$

(ii) $\cot^2 \theta - 1 = \cos ec^2 \theta$ **(6 marks)**

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

T

d) Find the number of sides of:

(i) A polygon having sum of interior angles 1080^{o}

(ii) A regular polygon if each exterior angle is 24^{o} **(5 marks)**