THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

UPGRADING MATHEMATICS

AMA 1102: GEOMETRY

FINAL EXAMINATION

SERIES: AUGUST/SEPTEMBER 2011

TIME: 2 HOURS

Instructions to Candidates:
Question **ONE** which is **(COMPULSORY)** and any other **TWO** questions
Calculators may be used
This paper consist of **FIVE** printed pages

Question One

a) (i) Use the figure to determine the lengths of PS and PQ. Given PR = 3cm, PN = 15cm and PM = 4cm

(4 marks)

P

(ii) Find the value of x such that

$8\cos^2 x - 2\cos x - 1 = 0$ for $0 \le X \le 360^0$

(5 marks)

(iii) Find the length a and $\angle B$, given $\angle A^0 = 63$, b= 11 cm and c= 9 cm

b

(7 marks)

b) Express the following in surd Form and rationalize

$$\frac{\sin 60^0 - \tan 30^0}{\cos 45^0 - \tan 60^0}$$

(8 marks)

c) In the figure below $\underset{\sim}{OS} = 2\underset{\sim}{r}$ and OQ = $\frac{3}{2}\underset{\sim}{p}$, OR= $\underset{\sim}{r}$, OP= $\underset{\sim}{p}$

R

Write down the following vectors in terms of $\underset{\sim}{p}$ and $\underset{\sim}{r}$ (2 marks)

i) $\underset{\sim}{QR}$

ii) $\underset{\sim}{PS}$

iii) $\underset{\sim}{QS}$

Question Two

a) Use a ruler and a pair of compass only for these constructions

i) Construct triangle PQR, where PQ = 8 cm, PR = 7cm and $\angle QPR = 75^0$ (4 marks)

ii) Drop a perpendicular from R to meet PQ and A. Measure RA and hence find the area of triangle PQR (4 marks)

iii) Point B divides QR in the ratio 2:3, Locate B and measure PB (4 marks)

b) A tank in the shape of a circular frustum has perpendicular height 1.7m, base radius 2.5m and top radius 1.5m.

Find;

i) Volume in m^3 (6 marks)

ii) Its capacity in litres (20 marks)

Question Three

a) Using 6370 km as the radius of the earth,

i) Find the distance between towns;

P (43^0S 75^0W) and Q (43^0S, 28^0E) in;

a) Km (4 marks)
b) Nm (2 marks)

ii) Find the time taken by an aeroplane which flies at 400km/h from town A(16^0S, 58^0N) to town B (34^0N, 58^0W) (6 marks)

b) A ladder of length $5\sqrt{2}$ m leaning on a wall is inclined to the horizontal at $\angle 55^\circ$. A shadow is cast immediately below it from a bulb directly overhead.

Find;

i) Shadow length (3 marks)
ii) The perimeter of the triangle formed (5 marks)

Question Four

The following figure shows a triangle OAB in which it divides AB in the ratio 1:4 and N divides OB in the ratio 1:1

X

$\underset{\sim}{OA} = \underset{\sim}{a}, \underset{\sim}{OB} = \underset{\sim}{b}, \underset{\sim}{OX} = h, \underset{\sim}{OM}$ and $\underset{\sim}{AX} = k \underset{\sim}{AN}$

If

a) Express

i) OX in terms of a, b and h (6 marks)
ii) OX in terms of a, b and k (4 marks)

b) Determine the values of h and k (6 marks)

c) Substitute the values of h and k in OX expressed in (i) and (ii). Comment on the solution. (4 marks)

Question Five

a) PQR is chord 6 cm away from the centre O of a circle of radius OQS= 8cm

O

Calculate

i) The length of the chord (3 marks)
ii) The angle subs-tended by the chord at the centre (3 marks)
iii) The area of sector OPSR (2 marks)
iv) The area of triangle OPR (2 marks)
v) The area of segment PSR (2 marks)

$$\frac{25}{64}$$

b) The ratio of the area of two similar rooms is

i) Find the area of the big room if the smaller one is $12cm^2$ (2 marks)

ii) Find the ratio of their lengths (2 marks)

iii) If the volume of the larger room $116m^3$, find the volume of the smaller room. (3 marks)