TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

CERTIFICATE IN BUILDING & CIVIL ENGINEERIG (CBCE)

AMA 1102: GEOMETRY

END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2013
TIME ALLOWED: 2 HOURS

<u>**Instructions to Candidates:**</u>
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° and $\angle$AGE = 32°.

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)**

f) A pentagon has the following interior angles $x^o, (2x - 50^o),\ 2x,\ (2x - 10),\ (x + 40)$, calculate:
   (i) The value of x **(4 marks)**
   (ii) All he interior angles **(4 marks)**
   (iii) All the exterior angles **(4 marks)**

Question Two

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

b) For the following trigonometric graphs, state the wave length amplitude and phase angle.
   (i) $Y = -\sin(3x + 60^o)$ **(2 marks)**
   (ii) $Y = \sin\left(\frac{1}{2}x + 10^o\right)$ **(2 marks)**
   (iii) $y = 3\cos(x + 40^o)$

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)

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

d) Given that vectors and find:

(i) $AB + BC$ **(2 marks)**

(ii) $\frac{1}{2}BC$ **(2 marks)**

$$y = f(x) = 4x^2 + 2x + 1$$

(iii) classify the turning points of **(15 marks)**

(iv) Given $y = (x^2 + 1)(x^3 + 2x)$, find $\frac{dy}{dx}$ **(5 marks)**

Question Four

a) Differentiate $f(x) = \frac{1}{2x}$ from first principles **(8 marks)**

b) Find $\frac{dy}{dx}$ of: $y = 1 + \frac{1}{x} + \sqrt[3]{x^2 - 2}$ **(8 marks)**

c) The displacement, s(metres) of a particle at time t (seconds) is given by $S = 0.3t + 0.6t^2 - 0.02t^{\frac{5}{2}}$
Find its velocity at time t = 3 seconds **(4 marks)**

Question Five

a) The rate of increase of radius of sphere is 0.5mm per second. Find rate of increase of volume of the sphere when radius is 30cm. **(8 marks)**

b) Find $f''(x)$

$$f(x) = \frac{1}{6}x^3 + \frac{1}{2}x^2$$

(i)

$$f(x) = \frac{1}{3\sqrt{x}}$$

(ii)

$$f(x) = x^{3/2}$$

(iii) **(6 marks)**

c) If $S = t^4 \cos wt$ where w is a constant, find $\frac{ds}{dt}$

(6 marks)