THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

CERTIFICATE IN CONSTRUCTION TECHNICIAN PART II

AMA 1110: GEOMETRY I

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: FEBRUARY/MARCH 2012

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination
- *Answer booklet*
- *Mathematical Tables/Calculator*

This paper consists of **FIVE** questions
Answer question **ONE (COMPULSORY)** from **SECTION A** and any other **TWO** questions from **SECTION B**
Maximum marks for each part of a question are clearly shown
This paper consists of **THREE** printed pages

SECTION A (COMPULSORY)

Question 1 (30 marks)

a) Three forces of magnitude 200KN, 100KN and 50KN act at a point in the same plane at 30°, 120° and 25° from the horizontal respectively.

Determine:

(i)   Magnitude of resultant forces
(ii) The angle between the resultant force and the smallest force   (10 marks)

b) A circular pole 4m long has a section cut off along its entire length. The maximum thickness for the cut off is 0.07m as shown in figure 1. Find:

(i)   Volume for the off cut
(ii) Area of the curved surface   (10 marks)

Fig 1

SECTION B (Answer *any TWO questions from this section*)

Question 2

$$F = 2i + j - KN$$

a) (i)   A force   acts on a line passing through a point A. Find moment M and its magnitude about point B. The co-ordinates for points A and B are (1,2,3)M and (0, 1,1) respectively.

(ii) Find the work done by the force in a(i)   (10 marks)

$$P = 3i + 2j - k$$
$$Q = i - j + 0.5k$$

b) Two forces are given as
   Find:
   (i)   P . Q
   (ii)   P – Q
   (iii) P x Q   (10 marks)

Question 3

a) Two forces of magnitudes 1.30N and 200N at a point in the same plane the angle between the forces is 45° 10' and the 200N force is in the horizontal plane. Find:

    (i)   The resultant force

    (ii)   The direction in which the resultant acts from the 200N force   (10 marks)

Question 4

a) Given $a = 2i + 4k$ and $b = 3i + 4j + 5k$

    (i) $a - b$

    (ii) $|a + b|$

    (iii)   Angle between a and b (10 marks)

b) A tunnel is 20m long, the width and height of the wall are 6m and 4m respectively. The center of the rectangular section is also the centre for the arched section. Find

    (i)   Surface area for the roof

    (ii)   Volume of rocks were removed   (10 marks)

Question 5

a) Two velocities are expressed in the form

$$V_1 = 3i + 6j - k$$

$$V_2 = 2i + 2j + 2k$$

Determine:

    (i) $V_1 + V_2$

    (ii) $V_1 - V_2$

    (iii)   Angle between the vectors   (8 marks)

b) Figure 2 shows a cross section of a tunnel that was laid across a load v/m in width.

    (i)   Volume conveyed by the culvert when the running full

    (ii)   Volume of material used to cover the culvert   (12 marks)

0.45m