THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

Faculty of Engineering & Technology

DEPARTMENT OF CIVIL AND BUILDING ENGINEERING

CERTIFICATE IN CONSTRUCTION TECHNICIAN II (09A)

END OF SEMESTER EXAMINATIONS

APRIL/MAY 2010 SERIES

AH 1104 : GEOMETRY II

TIME: 2 HOURS

Instructions to Candidates

This paper consists of **TWO** sections, i.e.
Section **A,** consisting of question **ONE** which is **COMPULOSRY** and Section **B.**
Choose **ANY TWO** questions in Section **B.**
Maximum marks for each question is shown.

SECTION A (Question ONE is COMPULSORY)

Question ONE

(a). Two forces of magnitudes 300KN and 250KN make an angle of 60^{o} with each other and are applied to an object at the same point. Determine:

(i). magnitude of resultant force.
(ii). the angle it makes with the force of 300KN.

(10 Marks)

(b). If $\underset{\sim}{A} = 3i + 6j - k$ and $\underset{\sim}{B} = 2i + j + 2k$. Determine:

(i). $\underset{\sim}{A} + \underset{\sim}{B}$

(ii). $\left|\underset{\sim}{A} + \underset{\sim}{B}\right|$

(iii). $\underset{\sim}{A} \cdot \underset{\sim}{B}$

(5 Marks)

(c). A tunnel of maximum height 4m is 2.24m wide. The arched roof of the tunnel has a maximum rise of 0.45m. The tunnel is 20m long. Determine:

(i). Radius of the arch
(ii). Volume of the rocks removed on excavation

(15 Marks)

SECTION B (CHOOSE ANY TWO QUESTIONS)

Question TWO

(a). In a construction project taking **SIX** months there were 3 surveyors, 4 carpenters, and 2 painters in the first two months. In the second two months, there were 1 surveyor, 6 carpenters and 8 painters. In the final two months, there were 2 surveyors, 2 carpenters and 10 painters.
It costs the company, Kshs.620,000, Kshs.660,000 and Ksh.640,000 to maintain them in the first, second and final two months, respectively.
Determine:

(i). Maintenance cost for each trade per month.

(10 Marks)

(b). A water engineer wanted to design a water tank whose capacity was to be equivalent to a cone of base radius 12m and vertical height of 4m. If the water tank was to take the shape of a frustrum with base radius 12m and upper radius of 3m.
Determine dimensions of the frustrum. **(10 Marks)**

Question THREE

(a). Fig. 1 below shows a cross-section of a tank 3.5m long.

Calculate:

(i). Capacity of the tank.
(ii). Surface area of the tank.

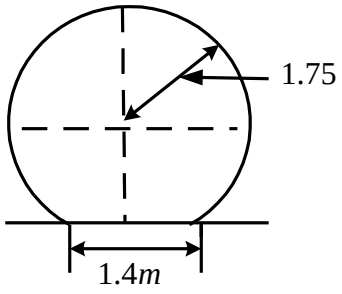

Fig. 1

(12 Marks)

(b). Solve,

$$x + y + z = 0$$
$$2x + y + 2z = 2$$
$$4x - 3y + 2z = 16$$

(8 Marks)

Question FOUR

(a). An airplane can fly at an air speed of 300miles/hr. If there is a wind blowing towards the east at 50miles/hr.

(i). What should the plane's compass heading in order for its course to be 30^{o}?.
(ii). What will be the plane's ground speed if it flies this course?

(b). Given $a = i + 2j + k$ and $b = 2i + 3j - 6k$

(i). $\underset{\sim}{a}.\underset{\sim}{b}$

(ii). $\left|\underset{\sim}{a}+\underset{\sim}{b}\right|$

(iii). Angle between $\underset{\sim}{a}$ and $\underset{\sim}{b}$

(iv). $\underset{\sim}{a}\times\underset{\sim}{b}$

(5 Marks)

(c). A tunnel 10m long has an arched roof. The centre of the rectangle formed by the floor and the walls is also the centre of the roof. Determine:

(i). Maximum height of the roof. **(8 Marks)**

Question FIVE

(a). A force of magnitude 112KN and one of 84KN are applied to an object at the same point and the resultant ha a magnitude of 162KN. Find to the nearest tenth of a degree the angle made by the resultant force with the force of 112KN.

(11 Marks)

(b). A cylindrical tank 2m in diameter is 3m long. It lies on a flat surface and is filled with water to a depth of 0.5m. Calculate:

(i). Volume of empty space in the tank.

(9 Marks)