THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

(A Centre of Excellence)

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

CERTIFICATE IN CONSTRUCTION TECHNICIAN (PART I)

AMA 1112: GEOMETRY II

END OF SEMESTER EXAMINATION
SERIES: AUGUST 2012
TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

This paper consists of **FIVE** questions. Answer any **THREE** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One (20 Marks)

a) Three forces of magnitudes 100N, 250N and 300N act of the same point in the same plane at 30°, 120° and 210° from the horizontal respectively. Determine:

i) Magnitude of resultant force

ii) The direction at which the resultant acts. **(8 marks)**

b) The tunnel of maximum height 4m is 2.24m wide. The tunnel has an arched roof of maximum rise 0.45m. The length of the tunnel is 20m. Determine:

i) Radius of the arch

ii) Volume of the rock material removed on excavation. **(12 marks)**

Question Two (20 marks)

$\underset{\sim}{A} = 3\underset{\sim}{i} + 6\underset{\sim}{i} - \underset{\sim}{k}$ $B = 2\underset{\sim}{i} + \underset{\sim}{i} + \underset{\sim}{k}$

a) If and . Determine:

$\underset{\sim}{A} + \underset{\sim}{B}$

i)

$|\underset{\sim}{A} + \underset{\sim}{B}|$

ii)

$\underset{\sim}{A} \bullet \underset{\sim}{B}$

iii)

$\underset{\sim}{A}$ *and* $\underset{\sim}{B}$

iv) Angle between **(5 marks)**

b) Figure 1 shows a cross-section of tank 3.0m long. Calculate:

i) Surface area

ii) Capacity of the tank. **(12 marks)**

Figure 1

Question Three (20 marks)

a) A force acts on an object displacing the object from point A(3,1,4) to point B(0, -1,12). If the force is expressed as $2i + 3j - k$, find the work done by the force. **(8 marks)**

$\underset{\sim}{a} = \underset{\sim}{i} + 2\underset{\sim}{j} + \underset{\sim}{k}$ $\quad \underset{\sim}{b} = 2\underset{\sim}{i} + 3\underset{\sim}{j} - 5\underset{\sim}{k}$

b) Given and . Find:

i) |a|

ii) |a+b|

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

iv) $a \times b$ **(12 marks)**

Question Four (20 marks)

a) A linear function is given as $3y = 4x + 10$.

i) Find the equation another line parallel to this function if it passes through point (1,2).

ii) Find the equation of the normal at point (1,2) **(8 marks)**

b) A tunnel 10m long has an arched roof and a rectangular cross-section. The walls are 4m high whole the tunnel spans 6m. The centre of the rectangular cross-section is also the centre of the roof. Determine:

i) Maximum height of the roof

ii) Surface area of the roof **(12 marks)**

Question Five (20 marks)

a) Show that the general equation of a parabola is of the from $y^2 = y\,ax$. **(6 marks)**

$F = 2\underset{\sim}{i} + \underset{\sim}{j} - \underset{\sim}{k}$

b) A force displaces a particle from point A (1, 2,-3) to point B (0,1,-1). **(5 marks)**

c) A cylindrical tank 3m long is 2m is diameter the tank lies on a horizontal ground and is filled with water to depth of 0.5m. Calculate:

i) Volume of empty space in the tank

ii) Surface area of the tank in contact with the water. **(9 marks)**