THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)
Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

CONSTRUCTION TECHNICIAN PART I

AMA 1109: ALGEBRA II

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2011

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*
- *Scientific calculator*
- *A set of drawing instruments*

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) A series is of the form

$$10 + 9\tfrac{3}{4} + 9\tfrac{1}{2} + \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \tfrac{1}{4} + 0$$

Find; the sum of the terms (5 marks)

b) A compaction plant costs K£ 20,000. The plant depreciates at a rate of 0.2% per annum. The plant will be disposed as scrap when it becomes worthy K£ 500 or less. Find the number of years the plant will be disposed off. (5 marks)

c) (i) Expand $(1-x)^{1/3}$ up to the fourth term

(ii) Substitute $1/100$ for x in the expansion obtained in (i) to determine $\sqrt[3]{37}$. Let 27 x 37 = 999 (8 marks)

d) (i) Solve $z^3 + 27 = 0$ to get roots in the form $a + bj$

(ii) Represent the roots obtained in (i) on an Argand diagram. (12 marks)

SECTION B (Answer any TWO questions from this section)

Question 2 (20 marks)

a) A model has 8 polygonal sides forming an A.P. The sides have a perimeter of 18cm. First side is 1.3m. Find the increase in length for the sides (5 marks)

b) The supply of rock material to a construction site is 500 thousand tonnes this year, 108 thousand tones next year, 21.6 thousand tonnes following year and so on.

Find the year when less than 5 thousand tones will be supplied. (6 marks)

c) Pressure ‘p’ and volume ‘v’ of a gas are related by the expression; (9 marks)

$$Pv^3 = c$$

Where ‘c’ is a constant. Find the approximate change in ‘c’ when p is increased by 1% and v is decreased by 0.4%

Question 3 (20 marks)

a) (i) Expand $(5+x)^{1/3}$ up to the term containing x^3.

(ii) Using the expansion in (i) evaluate $\sqrt[3]{511}$ correct to 1 decimal places (8 marks)

b) (i) Find the square roots of *-15 - 85;* giving the answer in the form $a+bi$

(ii) Represent the roots in (i) on an Argand diagram (12 marks)

Question 4 (20 marks)

a) Find the number of ways -4 letters can be arranged from the word BRIDGE (3 marks)

b) A hockey team consisting of 5 men, 6 women is to be chosen from 7 men and 9 women. Find:

(i) The number of ways this can be done

(ii) The number of combinations in which men will be majority (5 marks)

c) A surveyor travels 15km north east followed by 20km at N 30°W and finally 18KN at S 60°W. using complex number method determine:

(i) The distance of the surveyor from the starting point

(ii) The direction of surveyor from starting point (12 marks)

Question 5 (20 marks)

a) A football tournament is to be arranged. There are to be 4 European teams from 10 national sides and 4 American teams from 8 national sides. Find the number of possible combinations(4 marks)

b) Three coplanar forces act at a point as follows:

90N, 120°; 150N, 60°, and 100N, 300°

Calculate using complex number method

(i) Magnitude of resultant

(ii) Direction of resultant (7 marks)

c) P is related to x and y by an expression of the form P = $K\frac{x^2}{y^{1/3}}$.

x is increased by 0.1%

y is decreased by 0.2%

Find the % change in P (9 marks)