



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

**DIPLOMA IN BUILDING & CIVIL ENGINEERING
DIPLOMA IN CIVIL ENGINEERING
DIPLOMA IN ARCHITECTURE**

AMA 2201: ALGEBRA

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: OCTOBER 2011

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer booklet*
- *Pocket/Scientific Calculator*

This paper consists 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

SECTION A (COMPULSORY)

Question 1

$$10 + 9\frac{3}{4} + 9\frac{1}{2} + \dots + \frac{1}{4} + 0,$$

- a) Given the series find:
- (i) The sixth term
 - (ii) The sum for the terms (10 marks)

- b) (i) Use binomial theorem to obtain the first four terms in the expansion of $(1 - 2x)^{\frac{1}{2}}$
- (ii) Using the expansion obtained in b(i) above, evaluate correct to five decimal places (10 marks)

- c) (i) Represent the following complex numbers on an Argand diagram.

$$z = -5 + 2j$$

$$z = -3 - 4j$$

- (ii) Express the complex numbers in c (i) in polar form (10 marks)

SECTION B (Answer any TWO questions from this section)

Question 2

- a) The third term of G.P is 81 and sixth term is -3. Find the following:
- (i) The eighth term
 - (ii) Sum of the first eight terms (10 marks)
- b) A committee of 5 members is to be selected from 5 Engineers and 7 technicians. Find;
- (i) The number of possible committees
 - (ii) The number of selections that would have a majority of technicians

Question 3

$$4^{x-1} = 3^{x+2}$$

- a) Solve the equation; (6 marks)

- b) Use binomial theorem to evaluate $\sqrt[5]{33}$ correct to 3 decimal places (8 marks)

- c) Find the number of terms in the following series if the sum of the terms is 480 (6 marks)

Question 4

- a) Given the complex numbers: $z = 2 + 3j$ and $z = 3 - 2j$ find;
- (i) $z_1 - z_2$ (ii) $z_1 - z_2$ (iii) z_1 / z_2 (10 marks)
- b) Use Demoivre's theorem to express; $z^3 = 8(\cos 60^\circ + 50 \sin 60^\circ)$ in the form $a + bj$ (10 marks)

Question 5

- a) A machine costs kshs 120,000 when new. It depreciates at a rate of 15% annually. Find the value of the machine after 10 years correct to a whole number (5 marks)
- b) A nail 100mm penetrates a solid timber at a rate of $\frac{4}{5}$ of each previous penetration. If the initial blow drives the nail by 20mm, find the total penetration after 12 blows. (6 marks)
- c) Two dice are thrown and the scores on the upper most faces recorded. Event A is that "A total score of at least eight"
Event -B is "The 5 scores on the two dice differ by not more than one"
- (i) Draw up the possibility space and a venn diagram
(ii) Find the following
- $n(A), n(B), n(A \cup B), n(A \cap B)$ (9 marks)