



**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 II**

**AMA 1112: ALGEBRA II**

**SPECIAL/SUPPLEMENTARY EXAMINATIONS**

**SERIES: JUNE 2011**

**TIME: 2 HOURS**

**Instructions to Candidates:**

This paper consists of **TWO** sections **SECTION A** and **B**

Attempt **ALL** questions in **SECTION A** and **ONLY TWO** in **SECTION B**

Calculators and Mathematical tables are allowed.

## SECTION A (Compulsory)

### Question 1

a) Evaluate

(i)  $5!$  (1 mark)

(ii)  $\frac{8!}{2! 6!}$  (2 marks)

(iii)  $\frac{(3!)^2}{2! 4!}$  (2 marks)

b) Write down the formula for the  $n^{\text{th}}$  term of the series given below.

(i)  $2 + 4 + 6 + 8 + \dots$  (2 marks)

(ii)  $1 + \frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \dots$  (2 marks)

c) Simplify;

(i)  $(2 + 3i) + (4 - i)$  (2 marks)

(ii)  $(3 + 4i)(3 - 4i)$  (2 marks)

(iii)  $(3 + 3i) - (4 - 2i)$  (2 marks)

d) Solve the following equations;

(i)  $x^2 + 9 = 0$  (2 marks)

(ii)  $x^2 - 1 = 0$  (2 marks)

(iii)  $x^3 + 25x = 0$  (2 marks)

- e) In how many ways can 5 different books be arranged on a shelf? (2 marks)
- f) How many four digit odd numbers can be paired from the set {5,7,8,9}, where no integer being used more than once. (3 marks)
- g) A student is asked to choose six letters from A,B,C,D,E,F,G and H. How many different combinations of six letters can be chosen, if each letter is chosen once. (4 marks)

## SECTION B

*(Answer any Two Questions)*

### Question 2

- a) The fourth term of a geometric series is 10 and the seventh term of the series is 80.

For this series find the:

- (i) Common ratio (4 marks)
- (ii) First term (3 marks)
- (iii) The sum of the first 20 terms giving your answer to the nearest whole number (3 marks)
- b) Evaluate,  ${}_{10}C_2$  (3 marks)
- c) In how many ways can 13 cards be selected from 52 playing cards? (4 marks)

- d) Express as factorial;

(i)  $6 \times 5 \times 4$  (1 mark)

(ii)  $\frac{10 \times 9}{2 \times 1}$  (2 marks)

### Question 3

- a) Express the following in the form  $a + ib$

(i)  $\frac{2-7i}{1+2i}$  (3 marks)

(ii)  $\frac{5+i}{i-3}$  (3 marks)

(iii)  $\frac{2+3i}{i}$  (3 marks)

b) Given that  $z = 1 + 3i$  :

(i) Express

$$z + \frac{2}{z}$$

$a + ib$

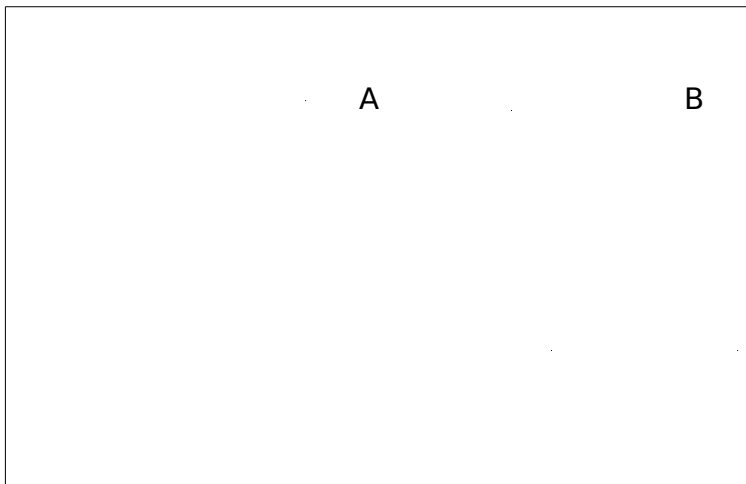
(ii) Find  $\arg z$ , giving your answer to the nearest 1 decimal place. (5 marks)  
(3 marks)

(iii) Find  $|z|$  (3 marks)

#### Question 4

Fig: 1

a)



Make four separate copies of Fig: 1;

- (i) On the first, shade in the area which represents  $A \cap B$  (1 mark)
- (ii) On the second, shade in the area which represents  $A^1$  (1 mark)
- (iii) On the third, shade in the area which represents  $(A \cup B)^1$  (1 mark)
- (iv) On the fourth shade in the area which represents  $A^1 \cup B$  (1 mark)

b) Expand  $(2 - 3x)^3$  and  $(3 + 2x)^3$  hence express  $3(2 - 3x)^3 - (3 + 2x)^3$  in terms of  $x$  (6 marks)

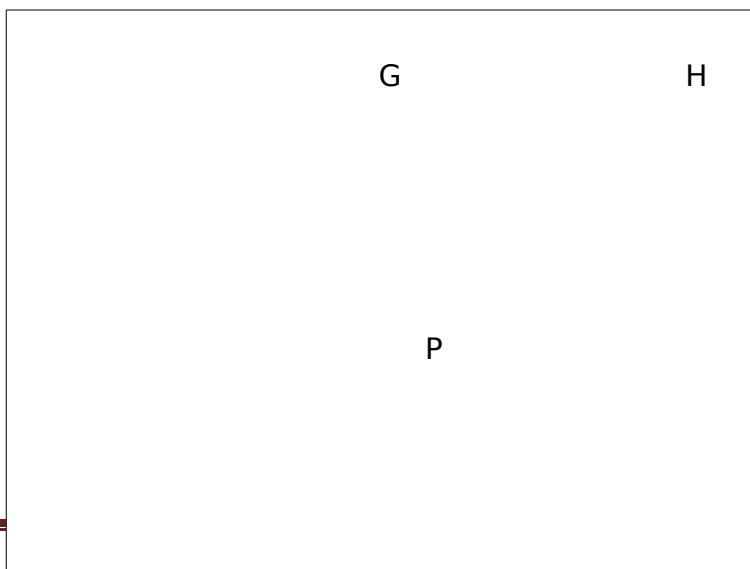
- c) Find the first 4 terms in the binomial expansion of  $(1 - 2x)^8$  and use to evaluate  $0.98^8$  to 6 decimal places. (7 marks)
- d) Simplify;

$$(1 - \sqrt{3})^4 + (1 + \sqrt{3})^4$$

(3 marks)

### Question 5

Fig: 2



At a school, a survey was carried out of the subject studied by the 120 pupils in fourth form class. After the survey the examination department was to find out how many of the pupils were to be entered for examinations in the Geography (G), History (H), and Physics (P). The results of the survey were as follows:

Ten (10) pupils studied all three subjects, whilst 13 pupils studied none of them. A total of 20 pupils studied both History and Geography, 30 pupils studied both Geography and Physics, and 25 students studied both History and Physics: Twelve pupils studied only Geography and 9 Physics only.

- a) Copy the Vern diagram (fig 2) and mark on your diagram the number of members in each of the eight regions. (8 marks)
- b) Find the total number of pupils who studied Physics (2 marks)
- c) Find the percentage studying;
  - (i) All the subjects (2 marks)
  - (ii) Geography (2 marks)

Entry for these examinations costs the school the following:

Geography	Ksh.	800
History	Ksh.	700
Physics	Ksh.	900

- d) Find the total cost of registering the 120 pupils for these examinations (6 marks)