



**TECHNICAL UNIVERSITY OF MOMBASA**  
**Faculty of Applied & Health**  
**Sciences**

DEPARTMENT OF MATHEMATICS & PHYSICS

**DIPOMA IN MARINE ENGINEERING**

EMR 2118: MARINE ENGINEERING MATHS I

**END OF SEMESTER EXAMINATION**

**SERIES: APRIL 2013**

**TIME: 2 HOURS**

**Instructions to Candidates:**

You should have the following for this examination

- *Answer Booklet*
- *Mathematical Table*
- *Calculator*

This paper consist of **FIVE** questions in **TWO** sections **A & B**

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 One

- a) The determinant of the matrix  $\begin{pmatrix} 2 & 6 \\ -1 & k \end{pmatrix}$  is 20.
- (i) Find K (1 mark)
- (ii) Find the inverse of the matrix  $\begin{pmatrix} 1 & 2 \\ -3 & -4 \end{pmatrix}$  (3 marks)
- b) Solve the equations below for x
- $\log_4 x + 4 \log_x 4 = 4$
- (i) (3 marks)
- $3^{2x+1} = 27^{2-x}$
- (ii) (3 marks)
- $\log_{10} 2x - \log_{10}(x-5) = 1$
- (iii) (3 marks)
- c) Using matrix method, solve the pair of equation given below:
- $2x + y = 5$   
 $5x + 3y = 7$
- (4 marks)
- d) The first, third and fifth terms of a geometric sequence form arithmetic sequence. If the first term of the sequence is 3. Find the 10<sup>th</sup> term of the geometric sequence. (4 marks)
- e) The ratio of the 10<sup>th</sup> to the 8<sup>th</sup> terms of a geometric sequence is 9. Find the two possible common ratios. (3 marks)
- f) The marks scored by 40 candidates in a mathematics test are shown in the table below.

Mark	f
12	2
13	3
14	5
15	8
16	15
17	6
18	3
19	1

Using an assumed mean of 16, calculate:

- (i) The mean mark (3 marks)  
(ii) The standard deviation of the mark (3 marks)

## SECTION B (Answer any TWO questions from this section)

### Question Two

a) Using indices evaluate:

$$\frac{(64)^{\frac{1}{6}} \times 8^{\frac{1}{3}} \div 2^5}{16}$$

(4 marks)

b) Solve each of the following equation:

$$3^{4x-4} = \frac{3}{3^{2x-4}}$$

(i) (4 marks)

$$8^x = 15$$

(ii) (3 marks)

$$81^{4x} \div 3^x = 27$$

(iii) (3 marks)

c) Solve for x given the following logarithmic equations:

$$\log_2 x + \log_x 2 = 2$$

(i) (3 marks)

$$\log x - \log(x-4) = \log 2$$

(ii) (3 marks)

### Question Three

a) Use the matrix method to solve the following simultaneous equations: (4 marks)

$$2x - 3y = 2$$

$$3x - 2y = 8$$

b) Joy bought 5 oranges, 4 apples and 10 bananas. Margaret bought 6 oranges, 2 apples and 15 bananas. If the prices of each orange, apple and banana were sh 51/=, 2/= and sh 3/= respectively, form matrices from the information and find the total expenditure of each person. (4 marks)

$$A = \begin{pmatrix} 3 & -2 \\ 4 & 5 \end{pmatrix} \quad B = \begin{pmatrix} 1 & -2 \\ 3 & 7 \end{pmatrix}$$

c) Given that  $(AB)^{-1}$  and find:

a)  $(A+B)^{-1}$  (4 marks)

b) (4 marks)

$$P = \begin{pmatrix} 1 & 2 \\ 0 & 4 \end{pmatrix} \quad Q = \begin{pmatrix} 2 & 0 \\ 1 & 3 \end{pmatrix} \quad R = \begin{pmatrix} 3 & 0 \\ 2 & 2 \end{pmatrix} \quad 3P - 2(Q + R)$$

d) Given and and find: (4 marks)

#### Question Four

a) The table below shows the distribution of marks scored by a group of candidates in a mathematics examination:

Marks	Frequency
1 – 10	1
11 – 20	3
21 – 30	7
31 – 40	9
41 – 50	21
51 – 60	10
61 – 70	6
71 – 80	5
81 – 90	2
91 – 100	1

a) Draw an ogive to illustrate the data (4 marks)

b) From your graphic estimate (1 mark)

(i) The median mark (3 marks)

(ii) The interquartile range (2 marks)

(iii) The number of candidates who passed if the pass mark was 48% (2 marks)

c) The table below shows the distribution of the number of words per sentence in a short story.

No. of words	2 – 5	6 – 9	10 – 13	14 – 17	18 – 21	22 – 25
No. of sentences	12	14	15	13	18	8

Calculate:

(i) The mean (7 marks)

(ii) The standard deviation (3 marks)

### Question Five

- a) The sum of the first **FOUR** terms of an arithmetic series is 46. If the sum of the first 10 terms is 25, find the first term and the common difference. **(5 marks)**
- b) The sum of the first three terms of a geometric series is 26. If the common ratio is 3, find the sum of the first six terms **(5 marks)**
- c) Calculate the rate of interest if shs 4,500 earns shs 500 after 4 years. **(2 marks)**
- d) Juan invested a certain amount of money in a bank which paid 12% p.a. simple interest. After 5 years, his total savings were sh 5,600. Determine the amount of money he invested initially. **(4 marks)**
- e) What would shs 15,000 amount to after 4 years at 16% p.a. compounded quarterly? **(4 marks)**