



TECHNICAL UNIVERSITY OF MOMBASA
Faculty of Applied & Health
Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

DIPLOMA IN MARINE ENGINEERING

AMA 2103: ENGINEERING MATHEMATICS I

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: MARCH 2014

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*
- *Scientific 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 **FOUR** printed pages
SECTION A (COMPULSORY)

Question One

a) (i) Without using tables evaluate:

$$24^{\frac{1}{3}} \times 81^{\frac{1}{6}} \times 125^{-\frac{1}{3}}$$

$$16 \log_x^3 = \log_3^x$$

(ii) Solve for x if

(8 marks)

b) The first term of a geometric progression is 8 and the nth term is 1/8 the common ratio is 1/2 determine the sum of the first n terms **(5 marks)**

$$A = \begin{pmatrix} 2 & 1 \\ 1 & 3 \end{pmatrix} \quad B = \begin{pmatrix} 1 & 0 \\ 4 & 1 \end{pmatrix} \quad (AB)^{-1} = (BA)^{-1}$$

c) (i) Given that and determine if

(ii) In a soccer results, a win scores 3 point, a draw 1 point, and a loss no point. By forming matrices, determine the best team of the following:

Team	Wins	Draws	Losses
A	15	1	3
B	13	6	0
C	8	6	5
D	13	3	3

(10 marks)

d) Table 1 shows the data of marks obtained by twenty students in a class:

Table 1

Marks (x)	3	4	5	6	8	9	10	11	13
Frequency (f)	2	1	5	3	3	2	1	1	2

Determine:

(i) The mean

(ii) The standard deviation without calculating deviations of the mean

(7 marks)

SECTION B (Answer any TWO questions from this section)

Question Two

a) Simply the following:

$$\frac{a^{1/2}b^{-1/2} \times a^{1/2}b^{1/2}}{a^{-1/2}b^{-1/2}}$$

(i)

$$\left(\frac{a^x}{a^y}\right)^{x+y} \times \left(\frac{a^4}{a^z}\right)^{y+z} \times \left(\frac{a^z}{a^x}\right)^{a+z}$$

(ii)

(7 marks)

b) Without using tables, evaluate the following:

$$3^{2x} - 9^{\left(x-\frac{1}{2}\right)} = 6$$

(i)

$$\log_a \left(\frac{1}{27} \right)$$

(ii)

(6 marks)

c) (i) If $P = \log_8 N$ and $q = \log_2 2N$ prove $q = 1 + 3p$
 $\log_2 3 = P,$ $\log_{27} 32$
 (ii) Given express in terms of p

(7 marks)

Question Three

- a) The 1st, 5th and last term of an arithmetic progression are 6, 202 and 447 respectively. Determine the number of terms of the arithmetic progression (4 marks)
- b) In a geometric progression, the sum of the 3rd and 4th terms is 6. Determine the first term, common ratio and the sum to infinity of the geometric progression (7 marks)
- c) A geometric progression has 1st term a, common ratio r and the sum to its first n terms is 422.

$$ar^{a-1} = \frac{422(r-1) + a}{r}$$

(i) Show that

(ii) If the 1st and nth terms are 32 and 162 respectively, determine r and n.

(9 marks)

Question Four

a) Find the value of the following:

$$(15 \div 3 + 4) - (3^2 - 7 \times 2)$$

(i)

$$\frac{4^2 - 6 + 5}{(3^2 + 8 - 7 \times 2)}$$

(ii)

(4 marks)

- b) Determine the greatest common factor (GCF) and lowest common multiple (LCM) of 2250 and 980
(4 marks)
- c) Simplify the following:

$$\frac{6}{3x+3y} - \frac{x}{x^2-xy}$$
 (i)

$$\frac{(x+2)^{1/2}(x-1)^{1/2} + (x+2)^{-1/2}(x-)^{1/2}}{(x+2)^{-1/2}(x-1)^{-1/2}}$$
 (ii) (7 marks)
- d) If $\frac{a}{2x-3} + \frac{b}{3x+4} = \frac{x+7}{(2x-3)(3x+4)}$ determine the values of a and b (5 marks)

Question Five

- a) In a work study investigation, the times taken by 20 men in a firm to do a particular job were tabulated as shown in table 2.

Table 2:

Time (mm)	8 – 10	11 – 13	14 – 16	17 – 18	20 – 22	23 – 25
Frequency	2	4	6	4	3	1

Calculate:

- (i) The median
 (ii) Interquartile range
 (iii) 40th percentile (12 marks)
- b) Table 3 is the data for the marks obtained in a test by 88 students.

Table 2

Marks (x)	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	2	5	16	9	5

Calculate without using deviation

- (i) The mean mark
 (ii) The standard deviation (8 marks)