



TECHNICAL UNIVERSITY OF MOMBASA
Faculty of Applied & Health
Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS
CERTIFICATE (UPGRADING MATHEMATICS)

AMA 1101: ALGEBRA

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: OCTOBER 2013
TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*
- *Mathematical Tables*
- *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) Make Q the subject of the formula:

$$x = y \sqrt{\frac{Q}{Q-N}}$$

(3 marks)

b) Solve the simultaneous equation below:

$$4x + 3y + 7 = 0$$

$$7x + 6y + 16 = 0$$

(3 marks)

$$\frac{x+2}{4} - \frac{x+3}{5} = \frac{x+4}{6}$$

c) Find the value of x in the equation:

(4 marks)

d) A piece of wire 200cm long is bent to form a rectangular shape. One side of the rectangle is 4cm long that the other. Find the dimensions of the rectangle.

(4 marks)

e) Using the indicated method, solve the quadratic equations given below:

$$2x^2 - 7x + 3 = 0$$

(i) {factorization} (3 marks)

$$3x^2 - 7x + 4 = 0$$

(ii) {completing square} (3 marks)

$$2x^2 + 6x - 5 = 0$$

(iii) {quadratic method} (3 marks)

$$3^{2x} - 4(3^x) + 3 = 0$$

f) Solve for x in (4 marks)

g) If y is inversely proportion al to x^2 and $y = 3$ when $x = 4$, find y when $x = 2$ (3 marks)

SECTION B (Answer any TWO questions from this section)

Question Two

$$y = 2x^2 + x - 1 \quad -4 \leq x \leq 4$$

a) Draw the graph of $y = 2x^2 + x - 1$ for $-4 \leq x \leq 4$ using the integral (integer) values of x to obtain y values. (6 marks)

b) Use the graph to in (a) to obtain the solutions of the equations below. (1 marks)

$$2x^2 + x - 1 = 0$$

(i)

$$2x^2 - 5 = 0$$

(ii)

(3 marks)

- c) Find the average speed of a train if an increase in its speed by 10km/hr reduces the time for a journey of 120km by 36 minutes. (6 marks)
- d) The length of a room is 4m longer than the width and the floor area is 96m². Find the length and the breadth. (4 marks)

Question Three

- a) (i) Express in the form $a + b\sqrt{c}$ in the surd expression:

$$\frac{3}{\sqrt{2} + \sqrt{3}} + \frac{3}{\sqrt{2} - \sqrt{3}}$$

(2 marks)

$$\frac{4 + \sqrt{5}}{2 - \sqrt{3}}$$

(2 marks)

- (ii) Rationalize the denominator in
- b) Solve the equations below:

$$\log_2 12 - 3\log_2 x = \log_2 96$$

(i)

(3 marks)

$$\log_{10}(3x - 4) - \log_{10}(3 - x) = \log_{10} 10$$

(ii)

(3 marks)

- c) Find x given that:

(4 marks)

$$(2^{x+2}) \times 3 = 4^x$$

- d) Simplify without using tables or calculator

(3 marks)

$$\frac{\log 25 - \log 625}{\log 5}$$

(3 marks)

- e) Solve for x in the equation:

$$\log_3 x - 2\log_x 3 = 1$$

(3 marks)

Question Four

- a) The first term of an arithmetic sequence is 4 and the last term is 64. If the common difference is 5, find the number of terms. **(3 marks)**
- b) The ratio of the fourth to the first term of a geometric sequence is $\frac{1}{8}$. If the first term exceeds the second by 5, find the first and the 8th terms of the sequence. **(6 marks)**
- c) A man buys premium bonds every year. In the first year, he buys shs 2,000 worth of bonds. If every year he increases his annual investment in bonds by sh. 600, how long will he take for his total investment in bonds to be shs 37,000. **(6 marks)**
- d) What is the least number of terms of the G.P, $2+4+8\dots$ that will give a sum greater than 1,500,00 **(5 marks)**

Question Five

- a) Expand $\left(x + \frac{2}{x}\right)^5$ in descending powers of x **(5 marks)**
- b) Use the binomial expansion to evaluate $(1.2)^5$ **(4 marks)**
- c) Use binomial expansion to obtain expansion $(1 + 2x)^{10}$, in ascending powers of x up to the term in x^3 . **(4 marks)**
- d) Using Pascals triangle obtain the first four terms in the:
 $(1 - 2x)^8$
- (i) Expansion **(4 marks)**
- (ii) Use your expansion to find the value of $(0.98)^8$ correct to 4 decimal places. **(3 marks)**