



TECHNICAL UNIVERSITY OF MOMBASA
Faculty of Applied & Health
Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS
DIPLOMA IN MEDICAL LABORATORY (DMLS 13M)

AMA 2101: MATHS FOR SCIENCE

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

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

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) Define the following terms as used in mathematics:

(i) An linear equation

(1 marks)

(ii) An identity

(1 marks)

b) Evaluate the following:

$$\log_7 83.64$$

(3 marks)

c) Test for simple factors and hence solve the quadratic equation

$$2x^2 - 3x - 5 = 0$$

(5 marks)

d) Derive the quadratic formula

(6 marks)

e) Differentiate the following from first principles

$$y = x^{\frac{1}{2}}$$

(5 marks)

f) Evaluate the following:

$$y = \int (3x + 2)^4 dx$$

(4 marks)

g) Evaluate the following:

$$\int \left(4e^{2x+4} + \frac{3}{4x-1} \right) dx$$

(3 marks)

SECTION B (Answer any TWO questions from this section)

Question Two

a) Solve for the unknown in the following set of equations:

$$5(x + 2y) - 4(3x + 4z) - 2(x + 3y - 5z) = 16$$

$$2(3x - y) + 3(x - 2z) + 4(2x - 3y + z) = -16$$

$$4(y - 2z) + 2(2x - 4y - 3) - 3(x + 4y - 2z) = -62$$

(8 marks)

b) Simplify the following:

$$F = \sqrt[3]{a^6 b^3} \div \sqrt{\frac{1}{9} a^4 b^6} \times (4\sqrt{a^6 b^2})^{\frac{1}{2}}$$

(4 marks)

c) Solve for x in the following: (3 marks)
 $2 \log_{10} x = 4$

d) Solve by completing the square: (5 marks)
 $4x^2 - 16x + 3 = 0$

Question Three

a) Determine whether or not the following set of equations can be expressed as a product of linear factors.

(i) $x^2 - 9x + 18$ (1 mark)

(ii) $x^2 - 5x - 24$ (1 mark)

(iii) $2x^2 - 3x - 4$ (1 mark)

(iv) $3x^2 - 10x + 4$ (1 mark)

b) Find the differential coefficient of $y = \cos x$ from first principles (6 marks)

c) Given that $y = uv^{-1}$ where u and v are functions of x. Show that $\frac{dy}{dx} = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$ (5 marks)

And hence find $\frac{dy}{dx}$ of the following: $y = \frac{5e^x}{\cos x}$ (3 marks)

d) Solve for x in the following equations: $5(x - 1) + 3(2x + 9) - 2 = 4(3x - 1) + 2(4x + 3)$ (2 marks)

Question Four

a) Solve the equation: $7(14.3^{x+5}) \times 6.4^{2x} = 294$ (5 marks)

b) The length of a cylindrical pipe is 2m. Its external radius is 2.1cm, and the external radius is 1.4cm. Find the volume of the material that was used to make it. **(4 marks)**

c) Make r the subject of the following formular **(4 marks)**

$$d = h(2r - h)^{\frac{1}{2}}$$

d) Evaluate the following:

$$\int \frac{\ln x}{x} dx$$

(i) **(2 marks)**

$$\int \cos^5 x dx$$

(ii) **(3 marks)**

e) Solve for x in the following:

$$x^2 - 1 = 0$$

(2 marks)

$$y = uv$$

a) Given that $y = uv$, where u and v are functions of x show that:

$$\frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$$

(5 marks)

b) Find the differential coefficient of:

$$e^x \ln 5x$$

(i) **(3 marks)**

$$x^3 + y^3 + 3xy^2 = 8$$

(ii) **(3 marks)**

c) Differentiate between explicit and implicit functions. **(2 marks)**

$$x = a(\cos \theta + \theta \sin \theta) \quad y = a(\sin \theta - \theta \cos \theta)$$

d) Given that $x = a(\cos \theta + \theta \sin \theta)$ and $y = a(\sin \theta - \theta \cos \theta)$. Find:

$$\frac{dy}{dx}, \frac{dy^2}{dx^2}$$

(4 marks)