



TECHNICAL UNIVERSITY OF MOMBASA
Faculty of Applied & Health
Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

DIPLOMA IN COMMUNITY HEALTH
DIPLOMA IN PHARMACEUTICAL TECHNOLOGY

AMA 2101: MATHEMATICS FOR SCIENCE

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 **THREE** printed pages

SECTION A (COMPULSORY)

Question One

a) (i) Factorize $16x^2 - 1$ (2 marks)

(ii) Simplify $\left(\frac{27}{8}\right)^{-2/3}$

(iii) Solve $2.75^x = 7$ (2 marks)

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$$A = \begin{pmatrix} 7 & 5 \\ 2 & 3 \end{pmatrix}$$

b) Find the inverse of (3 marks)

$$\frac{1-5x}{4} - \frac{1(1-3x)}{5} = 7$$

c) Solve (3 marks)

$$x = \sqrt{\frac{5-a}{5-b}}$$

d) Make s the subject of (3 marks)

$$10x^2 + 11x - 6 = 0$$

e) Factorize and hence solve (3 marks)

$$\log_3 8$$

f) Change the base to 10 hence evaluate (4 marks)

(i) 7_{C_3}

g) Evaluate (2 marks)

8_{P_6}

(ii)

$$\frac{dy}{dx} \quad y = \frac{\sin x}{\cos x}$$

h) Find $\frac{dy}{dx}$ given $y = \frac{\sin x}{\cos x}$ using the quotient rule (3 marks)

SECTION B (Answer any TWO questions from this section)

Question Two

a) (i) Expand $(3x-1)(2x+1)$ (2 marks)

(ii) Solve $(3x-1)(2x+1) = 6x+5$ by factorization (3 marks)

b) Find the stationary points of $y = 2x^3 - 3x^2 - 12x$ and determine the nature of each. (3 marks)

c) Evaluate $\int_1^5 xe^x dx$ (3 marks)

d) Sketch the graph of $y = x^2 - 2x - 3$ for $-2 \leq x \leq 4$ and hence use it to solve:

(i) $x^2 - 2x - 3 = 0$ (2 marks)

(ii) $x^2 - 2x - 5 = 0$ (2 marks)

e) Differentiate $x^3 - 2xy^2 + y^2 = 7$ (3 marks)

Question Three

a) Without using tables or a calculator. Find (i) $\frac{1}{1 + \cos 45^\circ}$ (4 marks)

(ii) $\frac{1 - \cos 30^\circ}{1 + \sin 45^\circ}$ (4 marks)

b) Solve by Cramer's rule given:

$$x - 3y - 4z = 1$$

$$-x + y - 3z = 14$$

$$y - 3z = 5$$

(8 marks)

c) Given that $A = \begin{pmatrix} k & 4 \\ 3 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ find K given that the determinant of $AB = 4$ (4 marks)

Question Four

a) Show that (i) $\cos 2A = 2 \cos^2 A - 1$ (4 marks)

(ii) $\cos 2A = 1 - 2 \sin^2 A$ (4 marks)

$$S_{\infty} = \frac{Aa}{1-r}$$

- b) Show that the sum of infinity of a geometric progression is given by term and r is the common ratio. where a is the first (4 marks)

$$y = x^3$$

- c) Find from first principles the derivative of (4 marks)

$$\int x \ln x dx$$

- d) Integrate (4 marks)

Question Five

$$x^2 - 6x + 13 = 0$$

- a) Solve quadratic formula (4 marks)

$$\frac{1 + \tan 60^\circ}{1 - \tan 60^\circ}$$

- b) (i) Express in surd form (4 marks)

$$V(t) = 5t^4$$

- c) Given that the velocity of a particle is and that the distance $S = 9$ when $t = 0$, find an expression for the distance $s(t)$. (5 marks)

$$y = 4x - x^2$$

- d) Sketching the curves and area and evaluate the area bounded by the curve and the line $y = 2x$ (4 marks)