



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)
Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

DIPLOMA IN MEDICAL LABORATORY SCIENCES

AMA 2103: MATHEMATICS FOR SCIENCE

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: MAY/JUNE 2012

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

This paper consists of **FIVE** questions

Answer question **ONE (COMPULSORY)** and any **TWO** questions

Maximum marks for each part of a question are clearly shown

This paper consists of **THREE** printed pages

SECTION A (COMPULSORY)

Question 1

- a) Rewrite $2x^2 - 6x + 7$ in the form $a(X + P)^2 + q$ (5 marks)
- b) Solve $17 - 18x \geq 5x - 4$ (3 marks)
- c) Find the volume of the solid of revolution generated by rotating the curve the graph of $y = \sqrt{x}$ from $x = 0$ to $x = 1$ about the x-axis (5 marks)
- d) At what interest rate will money double in 10 years if compound yearly? (4 marks)
- e) $\int \cos(5x + 2) dx$ (4 marks)
- f) Expand using the binomial expansion $(1 - x)^{-2}$ (5 marks)
- g) Find the probability of drawing first and Ace and then a King from a pack of playing cards (4 marks)

SECTION B (Answer any TWO questions from this section)

Question 2

- a) Prove that $\frac{1 - \tan A}{\sec A} + \frac{\sec A}{\tan A} = \frac{1 + \tan A}{\sec A \tan A}$ (4 marks)
- b) Solve $5 = 3e^{-2x}$ (4 marks)
- c) Rationalize $\frac{1 + 3\sqrt{2}}{5 - \sqrt{2}}$ (3 marks)
- d) Solve the differential equation $\frac{dy}{dx} + 3y = e^{2x}$ (4 marks)
- e) Using the Binomial expansion to evaluate $(1.025)^7$ to three decimal places (5 marks)

Question 3

- a) From first principles, differentiate $y = \frac{1}{x}$ (4 marks)

$$4x^2 + 4x + 8y - 11 = 0$$

- b) Find the centre and radius of the circle by rewriting the equation in the

$$(x-a)^2 + (y-b)^2 = r^2$$

form

(4 marks)

- c) If a heavy ball is released from rest at $t = 0$, the distance(s) further after time t seconds is given by

$$S = \frac{1}{2}gt^2$$

, where g is acceleration due to gravity. Find:

$$g = 980\text{cm/sec}^2$$

- (i) The distance in metres after two seconds given . (2 marks)

- (ii) The velocity after two seconds (2 marks)

$$(3x - 4y)^5$$

- d) Expand , using Pascal's triangle (4 marks)

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

- e) (4 marks)

Question 4

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 1 & 3 & 3 \\ 1 & 2 & 4 \end{pmatrix} \quad B = \begin{pmatrix} 6 & -2 & -3 \\ -1 & 1 & 0 \\ -1 & 0 & 1 \end{pmatrix}$$

- a) Given and . Determine AB hence solve

$$x + 2y + 3z = 2$$

$$x + 3y + 3z = 1$$

$$x + 2y + 4z = 2$$

(5 marks)

$$\log_2 x + \log_2 (x - 6) = 4$$

- b) Solve (3 marks)

- c) If shs 3000 is deposited at 8% annually compounded quarterly, find

- (i) The amount after 5 years (4 marks)

- (ii) When the account first exceeds shs. 5000 (4 marks)

$$y = \sin x \quad -360 \leq x \leq 360 \quad \sin x = 0.7660$$

- d) Plot the graph of for . Use it to solve (4 marks)

Question 5

- a) Simplify $\frac{27^{\frac{1}{2}} \times 243^{\frac{1}{2}}}{243^{\frac{4}{3}}}$ using indices (3 marks)
- b) Express in surd form $\frac{1}{1 + \cos 45^\circ}$ (3 marks)
- c) Evaluate to six significant figure using the binomial expansion $(8.016)^4$. (4 marks)
- d) Differentiate from first principles $y = \sin x$ (4 marks)
- e) Evaluate and leave your answer in surd form $(2 + \sqrt{3})(5 - 4\sqrt{3})$. (2 marks)
- f) Find the maximum and minimum values of $y = x^2 e^x$ (4 marks)