



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN NAUTICAL SCIENCE

AMA 2213: MATHEMATICS 11

END OF SEMESTER EXAMINATION

SERIES: AUGUST 2017

TIME: 2 HOURS

DATE: Pick Date Sep 2017

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other **TWO** questions.

Do not write on the question paper.

Question ONE

a). Express the equations:

i). $x^2 + y^2 = 3y$ in polar form

(3marks)

ii). $r^2 = 5 \csc 2\theta$ In Cartesian form

(3marks)

b). On commencing employment, a man is paid a salary of Ksh.880,000 per annum, and receives an annual

increment of ksh.3600.

Determine his:

i). Salary in the eighth year
(3marks)

ii). Total earnings in the first 9 years. (5 marks)

b). Given that:

$$f(x) = \frac{3x-1}{2x+1} \quad \text{find} \quad f^{-1}(1)$$

(6marks)

c). Solve the equation $\sin 3x + \sin x = 0$ for values of x , where $-180^\circ < x < 180^\circ$
(7 marks)

d). Differentiate using first principle $y = 3x^{-2} + 2x$ (5 marks)

Question TWO

a). Sketch the region bounded by the curve $y = x^3 - 5x^2 + 4x$ and the lines $x = 0$ and $x = 3$

and hence use integration to find the area of the region defined.
(12 marks)

b). The table shows the number of items and their corresponding costs:

Number of items (x)	Cost per item(y) in ksh.
2	48
4	54
8	68
5	75
10	88

Determine the product moment correlation coefficient between the two variables and comment on the results.

(8 marks).

Question THREE

a).Obtain the value of k for which $(k + 1), (k - 5), (k - 2) \dots \dots \dots$ is a Geometric progression

Hence find the sum of the first 12 terms.

(9 marks)

b).A plane flies due east and then due south in kilometers between London $(51.30^{\circ}N, 0.10^{\circ}W)$ and

Mecca $(21.26^{\circ}N, 39.49^{\circ}E)$.Determine the distance travelled.

Take the circumference of the earth to be 40074km.

(11 marks)

Question FOUR

a).Given that:

$$8 \cos \theta + 25 \sin \theta = R \cos(\theta - \alpha) \quad \text{where } R > 0 \text{ and } 0^{\circ} \leq \theta \leq 360^{\circ}$$

i).Find the values of R and α (4 marks)

ii). Solve the equation $8 \cos \theta + 25 \sin \theta = 2$ for $0^{\circ} \leq \theta \leq 360^{\circ}$ (6marks)

b).Expand $(5 + x)^{\frac{1}{3}}$ up to the term x^3 and hence evaluate $\sqrt[3]{5.1}$ to 5 decimal places. (10marks)

Question FIVE

a).The parametric equation of an ellipse is given by: $x = 7 \cos t, y = 4 \sin t$

where t is the parameter. Show that the Cartesian form of this equation is: $\frac{x^2}{49} + \frac{y^2}{16} = 1$ (10 marks)

b) A mechanical system is subjected to three forces A, B and C in such a way that :

$$2A + 3B + 4C = 13$$

$$3A - 4B + 5C = 9$$

$$6A + 2B - 3C = 2$$

Determine the magnitude of the forces A, B and C.

(10 marks)