



**TECHNICAL UNIVERSITY OF MOMBASA**  
FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF MATHEMATICS AND PHYSICS

**UNIVERSITY EXAMINATION FOR:**  
DIPLOMA IN MARINE ENGINEERING

EMR 2211: ENG MATHS IV.

END OF SEMESTER EXAMINATION

**SERIES:** MAY 2016

**TIME:** TWO HOURS

**DATE:** MAY 2016

**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** and any other **TWO**.

**Do not write on the question paper.**

**Question ONE**

- (a) Use binomial theorem to evaluate  $\sqrt{26}$  (3mks)
- (b) From 7 consonants and 4 vowels how many words containing 3 consonants and 2 vowels be formed? (3mks)
- (c) In how many ways can letters of the word LEADER be arranged? (3mks)
- (d) Solve  $\int (x^2 \sqrt{1-x^2})$  (3mks)
- (e) Find  $\frac{dy}{dx}$  if  $y = (x^2 + 1)^{17}$  (4mks)
- (f) Find the derivative of  $\frac{2x^3}{4-x}$  (4mks)
- (g) For a certain type of computer, the length of time between charges of the battery are normally distributed with a mean of 50 hours and standard deviation of 15 hours. Find the probability that the length of charging will be between 50 hours and 70 hours (4mks)
- (h) The table below shows the number of defective bolts from a sample of 40

No of bolts	0	1	2	3	4	5
Frequency	20	8	6	4	1	1

Calculate the standard deviation of the data above (4mks)

## Question TWO

- (a) Determine the critical points and locate any relative maxima, minima and saddle point of the function defined by  $f(x,y) = 2 - x^2 - y^2 - yx$  (7mks)
- (b) Use binomial theorem to solve  $\sqrt[5]{33}$  (5mks)
- (c) Use first principles to find derivative of  $f(x) = 1 - x^2$  (5mks)
- (d) The life span of a machine is normally distributed with mean of 12 months and standard deviation 2 months. Find the probability of lasting less than 7 months (3mks)

## Question THREE

- (a) The annual salary of employee in an EPZ are approximately normally distributed with a mean of 50,000 shillings and standard deviation of 20,000 shillings
- (i) What percentage of works earn less than 40,000 shillings (3mks)
- (ii) What percentage of works earn between 45,000 and 65,000 (4mks)
- (iii) What percentage of works earn more than 40,000 shillings (3mks)
- (b) A particle **K** moves along a straight line 50 cm long. At time  $t = 0$ , **k** is at **A** and  $t$  seconds later its velocity  $v$  cm/s is given by  $v = 15 + 4t - 3t^2$ .
- a) Write down the expression for;
- i) The acceleration of **K** at time  $t$  seconds. (1mk)
- ii) The distance of **K** from **A** at time  $t$  seconds. (2mks)
- iii) Find  $t$  when **K** is instantaneously at rest. (2mks)
- iv) How far is **K** from **A** at this time? (3mks)
- (v) Find the period of time during which the acceleration of **P** is positive. (2mks)

## Question FOUR

- (a) Find the integral of  $\frac{x^3}{(1+x^4)^{1/3}}$  (5mks)
- (b) Find  $\frac{dy}{dx}$  of the function  $\frac{x^3(3x+1)}{x^4+2}$  (7mks)
- (c) Evaluate  $\int \sin(2x+4)dx$  (4mks)
- (d) In a conference of 9 schools, how many inter conferences football games are played during a season if the teams play each other exactly once (4mks)

## Question FIVE

- (a) 20 sheets of Aluminum alloy are examined for flaws. The table below is a summary of the results

No of flaws	0	1	2	3	4	5	6
Frequency	4	3	5	2	4	1	1

Find the probability assuming it's a poisson distribution that any randomly chosen sheet contains 3 or more flaws (8mks)

- (b) A manufacturing firm of metal pistons finds that on average 12% of pistons are rejected because they are either oversize or undersize. What is the probability that a bunch of 10 pistons will contain
- (i) no more than 2 rejects (4mks)
  - (ii) At least 2 rejects (4mks)
- (c) Distinguish between kurtosis and skewness (2mks)
- (d) Evaluate  $\int_0^1 (3x^2 + 4x + 5)dx$  (2mks)