

### **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  $\sqrt{26}$
- (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 $\frac{2x3}{4x^2}$	(4mks)

- (f) Find the derivative of  $\frac{1}{4-x}$
- (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

(3mks)

## **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 0f 12months and standard deviation 2months.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 a long a straight line 50 cm long. At time  $\mathbf{t} = 0$ ,  $\mathbf{k}$  is at A and t seconds later its velocity  $\mathbf{v} \operatorname{cm/s}$  is given by  $\mathbf{v} = \mathbf{15} + 4\mathbf{t} 3\mathbf{t}^2$ .
  - 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  $\mathbf{P}$  is positive. (2mks)

# **Question FOUR**

- (a) Find the integral of (5mks)  $\frac{X^3}{(1+x^4)^{1/3}}$ (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 sumr	nary of the results
(a) 20 sheets of Aluminum	andy are examined for maws		nary 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 poison 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)