

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 $\int (x2\sqrt{1-x2})$ (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 0f 12months and standard deviation 2months. Find the probability of lasting less than 7 months (3mks)

Ouestion 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 $\mathbf{t} = 0$, **k** is at **A** and **t** seconds later its velocity ${\bf v} {\bf cm/s}$ is given by ${\bf v} = {\bf 15} + {\bf 4t} - {\bf 3t}^2$.
 - a) Write down the expression for;
 - i) The acceleration of \mathbf{K} at time \mathbf{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 \bf{P} is positive. (2mks)

Ouestion FOUR

(a) Find the integral of

$$\frac{X^3}{(1+x^4)^{1/3}}$$

- (a) Find the integral of $\frac{X^3}{(1+x^4)^{1/3}}$ (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)

(5mks)

Ouestion 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 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)