



# TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

MATHEMATICS AND PHYSICS

## UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN MATHEMATICS AND COMPUTER SCIENCE

AMA 4228: NON PARAMETRIC METHODS

END OF SEMESTER EXAMINATION

**SERIES:MAY SERIES**

**TIME:2 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 5 questions. Attempt ONE AND ANY TWO.

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

### QUESTION ONE

- State the assumptions of the median test (3marks)
- State the properties of a chi square test of independence (3 marks)
- A study was done to investigate the influence of DHT on the rate of disappearance of ethanol from the plasma in order to determine if the inhibitory effect of DHT on alcohol dehydrogenase activity occurs in healthy men. Among the data collected were the following testosterone concentration before and after DHT treatment.

Before	21.5	23	21	21.8	22.8	14.7	21	23.4	20	29.5
after	9.4	17.2	13	6.4	4.8	4.5	10.7	15.6	12.5	7.7

Compute the p value if we wish to conclude that DHT treatment reduces concentration in healthy people. (5marks)

- The following table shows randomly selected geographic areas ranked by population density (X) and age adjusted death rate (Y)

X	8	2	7	4	9	3	10	1	6	5
Y	10	4	1	5	6	7	9	2	3	8

Obtain the spearman ranked correlation coefficient

- e. Use the data below to compute the median test (5marks)

Urban	35	26	27	21	27	38	23	26	46
Rural	29	50	43	22	42	32	25	45	26

- f. A study was done to compare the pharmacokinetics of both total and unbound cefpiramide in healthy volunteers and patients with alcoholic cirrhosis. The data obtained is given in the table below. Compute the Mann-Whitney test. (5marks)

volunteers	27.1	29.3	25.3	22.8	21.3	31.2	29.2	28.7	17.2	25.7	32.3
Alcoholic cirrhosis	18.1	12.3	8.8	10.3	8.5	29.3	8.1	6.9	7.9	14.6	11.1

- g. State the assumptions of the Kolmogorov-Smirnov (4marks)

## QUESTION TWO

- a. A dental research team wished to know if teaching people how to brush teeth would be beneficial. Ten pairs of patients oral score is given below for those who were educated (X) and the control group (Y)

X	15	20	35	30	35	25	2	15	15	20
Y	20	20	40	25	40	30	35	30	25	25

A low score indicates high level of oral hygiene teaching people how to brush teeth was beneficial. Using median test make inference on this data (10 marks)

- b. A psychologist selects a random sample of 15 handicapped students. Their manual dexterity scores were as follows 33,53,22,40,24,56,36,28,38,42,35,52,52,36,47. Do these data provide sufficient evidence to indicate that the mean score for the population is not 45 at 5% level of significance? (10 marks)

## QUESTION THREE

- a. The following table shows the pesticide residue levels in blood samples from four populations of human subjects. Use the Kruskal Wallis test to test at the 5% level of significance the null hypothesis that there is no difference among populations with respect to average level of pesticide residue

Population			
A	B	C	D
10	4	15	7
37	35	5	11
12	32	10	10
31	19	12	8

- b. Using the data set below, can we conclude that the age (X) and EEG (Y) output are inversely correlated at 5% level of significance? (10 marks)

X	20	21	22	24	27	30	31	33	55	38
Y	98	75	95	100	99	65	64	70	85	74

#### QUESTION FOUR

- a. A certain human trait is thought to be inherited according to the ratio 1:2:1 for homozygous dominant heterozygous and homozygous recessive. An examination of simple random sample of 200 individuals yielded the following distribution of the trait: dominant 43: heterozygous 125, recessive 32. We wish to know if these data provide sufficient evidence to cast doubt on the belief about the distribution of the trait.

Number of organism	frequency
0	5
1	14
2	15
3	23
4	16
5	9
6	3
7	3
8	1
9	1
10	0
Total	90

Test the null hypothesis that these data were drawn from a Poisson distribution (10marks)

- b. In an air pollution study, a random sample of 200 households was selected from each of two communities. A respondent was asked whether or not anyone in the house hold was affected by air pollution. The response was as follows

Community	Any member bothered by pollution?		
	Good	Poor	Total
I	43	157	200
II	81	119	200
Total	124	276	400

Can the researcher conclude that the two communities differ with respect to the variable of interest at 5% level of significance? (10 marks)

### QUESTION FIVE

- a. The following data shows the percentage of fluid recovered from antigen challenged sites following bronchoalveolar lavage among two groups

Normal	70	55	63	68	77	67				
Asthmatic	64	25	70	35	43	49	62	56	43	66

May we conclude on the basis of these data using Mann Whitney test that we can expect to recover less fluid from asthmatic subjects at 5%? (10 marks)

- b. For a sample of apparently normal subjects who served as controls in an experiment, the following systolic blood pressure readings were recorded at the beginning of the experiment. Can we conclude using Kolmogorov –Sminorv goodness of fit test that the sample is not normally distributed with a mean of 150 and a variance of 144?

162,130,147,153,141,177,154,157,137,151 (10marks)