

KABARAK



UNIVERSITY

UNIVERSITY EXAMINATIONS

2010/2011 ACADEMIC YEAR

**FOR THE DEGREE OF BACHELOR OF SCIENCE IN
ECONOMICS AND MATHEMATICS**

COURSE CODE: MATH 424

COURSE TITLE: NON PARAMETRIC STATISTICS

STREAM: Y4 S2

DAY: TUESDAY

TIME: 9.00 – 11.00 A.M

DATE: 14/12/2010

INSTRUCTIONS:

1. Answer **QUESTION ONE** and **TWO** other questions
2. Show all your working method and be neat

PLEASE TURN OVER

QUESTION ONE (30 MARKS)

- a) What are the advantages and limitations of nonparametric statistics **(3 marks)**
- b) Name four main test statistics used in analysing nonparametric statistics for one sample and/or two sample populations. **(3 marks)**
- c) What is an independent sample? How do you pick an independent sample to ensure its independence? Why do we need a sample to be independent? **(3 marks)**
- d) Chi-square is used for testing hypotheses, name the two possible hypotheses on χ^2 you learnt in this course. **(3 marks)**
- e) What is a one-tailed test and two tailed test **(3 marks)**
- f) What is a one-sample test and two-sample test **(3 marks)**
- g) Perform the two-sample median test using the data below at $\alpha=0.05$. **(5 marks)**

H_0 : The two samples come from populations with identical medians (i.e. the median performance is the same under the two teaching assistants)
 H_1 : The median of the two sampled populations are not equal.

<i>Number</i>	<i>Sample 1</i>	<i>Sample 2</i>	Total
Above median	6	6	12
Not above median	5	8	13
Total	11	14	25

- h) The efficiency of three different programs were applied to different problems to design assembly lines as follows: Check whether there is a significant difference between the efficiencies of different algorithms using Krusal-Wallis test at $\alpha=0.05$ **(7 marks)**

Efficiency (%)		
Program 1	Program 2	Program 3
75	95	78
82	85	86
68	72	63
71	87	70
84	93	90
90	76	89
73	81	84
86	59	67

QUESTION TWO (20 MARKS)

- a) Conduct the Mann-Whitney test for nonparametric testing of the two-tailed null hypothesis that there is no difference in salt level between two groups of patients at one of the referral hospitals in Kenya. **(10 marks)**

Sodium chloride preference data

Nomal group		Hypertensive Group	
Subject	Na ⁺	Subject	Na ⁺
1	10.2	1	92.8
2	2.2	2	54.8
3	0.0	3	51.6
4	2.6	4	61.7
5	0.0	5	250.8
6	43.1	6	84.5
7	45.8	7	34.7
8	63.6	8	62.2
9	1.8	9	11.0
10	0.0	10	39.1
11	3.7		
12	0.0		

- b) In Mendel’s experiments with peas he observed 315 round and yellow, 108 round and green, 101 wrinkled and yellow, and 32 wrinkled and green. According to his theory of heredity the numbers should be in the proportion of 9:3:3:1. Is there any evidence to doubt his theory at (i) 0.01, (ii) 0.05 level of significance? (iii) What is the P value of the observation? **(10 marks)**

QUESTION THREE (20 MARKS)

- a) Two interviewers at the same company rated several job applicants. The ratings are given in the table below:

Interviewer 1:	7	6	1	2	8	3	5	10	11	9	4
Interviewer 2:	2	3	5	8	7	6	4	10	11	9	1

- (i) Calculate the Spearman’s rank correlation coefficients ρ
 (ii) Test whether ρ is significantly different from zero at $\alpha= 01$ **(5 marks)**

- b) The monthly number of accidents before and after introducing a new traffic regulation on 9 different roads are given below. Check whether the monthly accidents is reduced using sign test at $\alpha=0.10$. **(5 marks)**

Road	1	2	3	4	5	6	7	8	9
Before	12	15	18	20	8	16	9	11	17
After	10	13	20	17	6	14	10	10	16

c) The marketing manager wishes to analyse the result of winning (W) or losing (L) a tender within his firm. He has taken a sample of 40 different quotations and listed them below. Check whether the events of winning or losing the orders is random at $\alpha=0.05$. **(10 marks)**

The orders are: WW LL WWWWWW LL WWW L WWW LL WW LL WW LLL W LL
WWW LL WW

QUESTION FOUR (20 MARKS)

a) In an experiment on two farms, the number of Calliandra seedlings that survived is given below

Survival of calliandra seedlings on two farms

Farm type	surviving	Not Surviving
Farm 1	10	8
Farm 2	15	4

i) Calculate the odds of each farm type.
 ii) Calculate the odds ratio and comment on the answer **(10 marks)**

b) Before a project on environmental management could be stated, a short survey of two

Division (Lurambi and Malava) in Western Kenya to assess the extent of erosion on farms before a decision is made on which Division has more serious problem of soil erosion. The farms that were affected with erosion were recorded below.

Divisions and erosion affected farms

Division	State of farms	
	Eroded	Not eroded
Lurambi	52	20
Malava	24	66

a) Calculate the risk of having erosion in each of the Divisions.
 b) Calculate the relative risk for the two Divisions. **(10 marks)**