KABARAK   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

2009/2010 ACADEMIC YEAR
FOR THE DEGREE OF BACHELOR OF SCIENCE IN
ECONOMICS AND MATHEMATICS

COURSE CODE: **MATH 424**

COURSE TITLE: **NON-PARAMETRIC METHODS**

STREAM: **Y4S2**

DAY: **THURSDAY**

TIME: **9.00 – 11.00 A.M.**

DATE: **18/03/2010**

INSTRUCTIONS:

(1) Answer question **ONE** and any other two Questions
(2) Show your workings clearly

PLEASE TURN OVER

QUESTION ONE (30 MARKS)

(a)   Briefly differentiate between parametric and Non-parametric methods

(b)   A company manufactures toothpaste in 17 containers. The management expects overfills (O) and underfills (U) to be random. If they are not, it is assumed something is wrong with the filling system and the production line is shut down. Should the line be shut down if the containers measure the following weights?

16.8   18.2   17.3   17.5   16.3   17.4   16.1   16.1
16.9   17.0   18.1   17.3   16.2   17.3   16.8
Take $\alpha = 0.05$

(c)   A spokesperson for an organization supporting property tax reductions in certain section of a city stated that the median annual income for household heads in that section was $15,000. A random sample of ten household heads from that section revealed the following annual incomes:

14,800 16,900 18,000 19,100 13,200 18,500 20,000 19,200 15,100 16,500

Using the sign test the hypothesis that the median income for the population from that section is $15,000 against the alternative that it is greater than $15,000. Use $\alpha = 0.1$

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

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

   (i)   Calculate the Spearman's rank correlation coefficient r_s
   (ii)   Test to see whether it is significantly different from zero at $\alpha = 0.01$
 (e) A special diet is fed to adult turkeys to see if they will gain weight. The before and after weights (in kg) are given below:

Before	28	24	29	30	32	33	25	26	28
After	30	29	31	32	32	35	29	25	31

Use the paired sample sign test at $\alpha = 0.05$ to see if there is weight gain.

QUESTION TWO (20 MARKS)

(a)   A researcher at an accounting firm wants to find out whether the current ratio for three industries is about the same. Random samples of eight firms in industry A, six firms in industry B and six firms in industry C are available. The current ratios are as follows:

Industry A: 1.38 1.55 1.90 2.00 1.22 2.11 1.98 1.61
Industry B: 2.33 2.50 2.79 3.01 1.99 2.45
Industry C: 1.06 1.37 1.09 1.65 1.44 1.11

Use the appropriate test at $\alpha = 0.05$

(b)   The following is a process produced by random experiment.

MMNNNNNMMMMMMNNMMMMMMNMMNNNNNNNNNNNNNMM MMMMMMMMM

Test for randomness at $\alpha = 0.01$ level of significance

QUESTION THREE (20 MARKS)

(a)   A university department is deciding on which of the two research proposals to support. It asked 11 members of staff to read the proposals and to award each of them a mark out of 100. The marks awarded were as follows:

Members of staff:	1	2	3	4	5	6	7	8	9	10	11
Proposal 1:	89	37	70	21	29	36	11	46	74	47	26
Proposal 2:	95	49	69	86	30	99	19	52	30	45	80

Use the sign test at 5% level of significance to test whether proposal 2 is better than proposal 1

(b)   Does the male stock market investor earn significantly more than female stock market investor? One study by NSE showed that the male investor has an income of 46,400 Ksh and the female investor has an income of 39,400 Ksh. Suppose an analyst wanted to prove that the male investor earns more than the female investor. The following data represent random samples of male and female investors from across Kenya.

	Male		Female
Ksh.	50,100	Ksh.	41,200
	47,800		36,600
	45,000		44,500
	51,500		47,800
	55,000		42,500
	53,850		47,500
	51,500		40,500
	63,900		28,900
	57,800		48,000
	61,100		42,300
	51,000		40,000
			31,400

The analyst uses the Mann-Whitney U test to determine whether the male investor earns significantly more than the female investor for $\alpha = 0.01$.

QUESTION FOUR (20 MARKS)

(a) Are the types of professional jobs held in computing industry independent of the number of years a person has worked in the industry? Suppose 246 workers are interviewed. Use the results obtained to determine whether type of professional job held in the computer industry is independent of years worked in the industry.

Professional Position

	Manager	Programme	Operator	Systems Analyst
0-3yrs	6	37	11	13
4-8 yrs	28	16	23	24
More than 8yrs	47	10	12	19

Test at $\alpha = 0.01$

(b) In the business credit institution industry the accounts receivable for companies are classified as being **"current"**, "**moderately late**", "**very late**" and "**uncollectable**". Industry figures show that the ratio of these four classes is 9:3:3:1. Pratt Associates has 800 accounts receivable, with 439,168, 133 and 60 falling in each class. Are the numbers in agreement with the industry ratio? Use $\alpha = 0.05$