UGANDA MARTYRS UNIVERSITY, NKOZI

FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS

BSC (GEN) II SPECIAL/SUPPLEMENTARY EXAMINATION

STA2101 NON-PARAMETRICS

YEAR 2014/2015

DATE:5^{th} Aug 2015
TIME:10:00-1:00pm 3*Hours*

Instructions

(i) *Attempt four (4) questions*

(ii) *Question 1 is compulsory*

(iii) *Read carefully the instructions on the answer booklet*

Question 1

Four brands of light bulbs are being considered for use in a large manufacturing plant. The director of purchasing asked for samples of 100 from each manufacturer. The numbers of acceptable and unacceptale bulbs from each manufacturer are shown below.

	Manufacturer			
	A	B	C	D
Unacceptable	12	8	5	11
acceptable	88	92	95	89
Total	100	100	100	100

At the 0.05 significance level, is there a difference in the quality of the bulbs.
Enter the **data into an Excel spreadsheet** and follow the normal procedures for testing the hypothesis [25 marks]

Question 2

(a) Define the following terms

(i) Non- parametrics [2 marks]

(ii) P-value [2 marks]

(b) Give advantages and disadvantages of using non-parametric procedures [7 marks]

(c) Gross sales before and after a training programis given by

sales person	1	2	3	4	5	6
sales before	90	83	105	97	110	78
sales after	97	80	110	93	123	84

Question 3

(a) In a particular Chi-Square goodness-of-fit test there are four categories and 200 observations. Use the o.o5 significance level

(i) How many degrees of freedom are there? [2 marks]

(ii) State the critical value [3 marks]

(b) The director of human resources collected the following data on absenteeism by day of the week. At the 0.05 significance level, can we conclude that there is a difference in the absence rate by day of the week?

Day	Frequency
Monday	124
Tuesday	74
Wednesday	104
Thursday	98
Friday	120

[20 marks]

Question 4

(a) Compare and contrast parametric and non parametric procedures [8 marks]

(b) In order to determine if vacation has any effect upon productivity of workers, a sample of 15 workers was selected at random and their productivity before and after the vacation was recorded as follows

Workers	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Before vacation	90	65	78	85	83	55	75	78	80	82	88	85	80	78	81
After vacation	80	71	80	88	82	51	72	75	85	86	85	88	87	80	84

Apply Wilcoxon matched pairs signed rank test to find if there is a significant change in productivity of workers due to vacation using $\alpha = 0.05$ [17 marks]

Question 5

(a) Define the following terms as applied to non-parametric statistics;

(i) Type I error [2 marks]

(ii) Type II error [2 marks]

(iii) A null hypothesis [2 marks]

(iv) An alternate hypothesis [2 marks]

(b) The commissions for sales of new cars are reported to average \$1,500 per month with a standard deviation of \$300. A sample of 500 sales representatives in the Northwest revealed the following distribution of commissions. At the 0.01 significance level, can we conclude that the population is normally distributed, with a mean of \$1,500 and a standard deviation of \$300?

less than 900	9
900 up to 1,200	63
1,200 up to 1,500	165
1,500 up to 1,800	180
1,800 up to 2,100	71
2,100 or more	12
Total	500

(17 marks)

Question 6

The following table shows voter reactions to new property tax plan in Kampala district according to party affiliation.

	Reaction		
Party affiliation	In favor	Neutral	opposed
DP	90	55	30
NRM	150	90	50
FDC	155	65	60

(i) Find the row and column totals [4 marks]

(ii) Grand total [2 marks]

(iii) Calculate the expected frequencies [6 marks]

(b) The following sample data were obtained from three populations that were not necessarily normal

sample		
1	2	3
50	38	35
52	49	41
55	51	42
60	52	46
65	56	51
	57	

(i) State the null hypothesis [2 marks]

(ii) Using the 5% level of risk, state the decision rule [3 marks]

(iii) Compute the value of the test statistic [6 marks]

(iv) what is your decision on the null hypothesis? [2 marks]