JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF MATHEMATICS AND ACTUARIAL SCIENCE

UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF SCIENCE ACTUARIAL

SPECIAL RESIT 2015/2016 ACADEMIC YEAR

MAIN REGULAR

COURSE CODE: SAS 403

COURSE TITLE: NON PARAMETRIC METHODS

EXAM VENUE: **STREAM: (BSc. Actuarial)**

DATE: **EXAM SESSION:**

TIME: 2.00 HOURS

Instructions:

1. **Answer question 1 (Compulsory) and ANY other 2 questions**
2. **Candidates are advised not to write on the question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

QUESTION ONE (20 MARKS)

a. State briefly what these test are applied for:

i. Wald-Wolfowitz run test
ii. Wilcoxon signed rank test
iii. Wilcoxon rank test
iv. Spearman's rank test
v. Wilcoxon rank sum test (10 marks)

b. A random variable Y has the density function $f(y) = \begin{cases} 0.2\,, & -1 < x \leq 0 \\ 0.2 + 1.2y\,, & 0 < x < 1 \end{cases}$

Compute

i. The lower quartile value.
ii. The 90^{th} and 10^{th} percentiles (10 marks)

c. By stating the Null and alternative hypothesis, use the Wilcoxon Signed Rank test at $\alpha = 0.05$ to test for symmetry given the data below.

21	16	23	20	22	17	17	25	23	22
21	23	18	24	15	20	24	22	26	19

(10 marks)

QUESTION TWO (20 MARKS)

a) Let $Y_1 < Y_2 < Y_3 < \cdots < Y_{25}$ be the order statistic of a random sample from a distribution of the continuous type. Compute the approximate value of $\Pr(Y_4 < \xi_{0.2} < Y_{12})$ hence state the associated confidence interval. (10 marks)

b) Perform a Chi- square test to investigate whether the following is drawn from a binomial distribution with parameter $p = 0.3$. Use a 5% level of significance.

x	0	1	2	3	4	5
f(x)	12	39	27	15	4	3

(10 marks)

QUESTION THREE (20 MARKS)

a) Consider the 2x2 contingecy table

a	b
c	d

Derive the Chi-square test statistics for the independence of rows and columns of this table (12 marks)

b) Of those interviewed for a job a group is found to be left handed while the other is right handed. Some of the interviwees are short sighted while others are long sighted.The data is captured as follows.

	Left handed	Right handed
Short sighted	50	80
Long sighted	75	65

One is interested in knowing whether or not for this sample, the hand naturally used is in any way related to eyesight. State and test the appropriate hypothesis at 5% level of significance. (8 marks)

QUESTION FOUR (20 MARKS)

a)

i. Assume you are given two independent populations X_1 and X_2. Suppose you want to test that samples differ possibly only in their locations, mention the test you would apply and an assumption you would. Also give a brief procedure about how you would apply this test. (5 marks)

ii. Apply the test above to this pair of samples

Sample 1	28	43	44	38	39	56	54	33	28	45
Sample 2	45	35	43	46	56	38	29	22	49	48

(15marks)

QUESTION FIVE (20 MARKS)

a) An electrical engineer must design a circuit to deliver the maximum amount of current to a display tube to achieve sufficient image brightness. Within her allowable design constraints, she has developed two candidate circuits and tests prototypes of each. The resulting data in micoamperes are as follows.

Circuit A	251	256	258	246	260	255	259	263	256	254	257	261
Circuit B	250	253	249	256	259	252	247	250	262	264		

By stating an appropriate hypothesis, test at 5% level of significance the hypothesis stated when the Wilcoxon Rank-Sum test is applied considering large sample approximation. (13 marks)

b. Give four advantages and three disadvantages of Non Parametric methods. (7 marks)