



MACHAKOS UNIVERSITY

University Examinations for 2018/2019 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF ACCOUNTING BANKING AND FINANCE

FOURTH YEAR SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF ECONOMICS & FINANCE

EES 405: NON-PARAMETRIC AND SEMI PARAMETRIC STATISTICS

DATE: 7/8/2019

TIME:

INSTRUCTIONS:

- (i) Answer question one (Compulsory) and any other two questions
- (ii) Do not write on the question paper
- (iii) Show your working clearly

QUESTION ONE (COMPULSORY)(30 MARKS)

- a) State four assumptions of non-parametric tests over their counter parts (4 marks)
- b) Briefly describe when to use each of the following non-parametric methods
 - i. Kruskal Wallis test (2 marks)
 - ii. Kolmogrov-Smirnov test (2 marks)
- c) Explain, giving examples the two decision errors that can arise in non-parametric tests (4 marks)

- d) 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

(5 marks)

- e) Ten candidates sat for two aptitude tests A and B, and the results were as follows.

candidate		1	2	3	4	5	6	7	8	9	10
Test A		20	15	13	10	14	15	18	19	14	12
Test B		6	8	8	4	5	7	3	6	8	9

By clearly stating the null and alternative hypothesis, test at 5% level of significance whether or not the results correlated.

(5 marks)

- f) A questionnaire used in an assessment is thought to give a median score of 50 in a group doing a particular course. When tried out on 20 students of another course, it gave the scores as follows;

26 46 39 58 62 41 65 49 54 50
 61 38 58 35 27 34 46 51 29 40

Test the hypothesis that the median is not 50 at 5% level of significance

(5 marks)

- g) What is a Kernel regression? Illustrate your explanation with examples.

(3 marks)

QUESTION TWO (20 MARKS)

- a) Test whether or not the following sample values are random. Assume that the sample values were observed in the strict order in which they appear in the rows of the table, the first and last observations being 71 and 66 respectively.

71	67	55	64	82	66	74	58	79	61
78	48	84	93	72	54	78	86	48	52
67	95	70	43	70	73	57	64	60	83
73	40	78	70	64	86	76	63	95	66

(8 marks)

- b) Explain the meaning of the following terms;
- i) Most powerful test (2 marks)
 - ii) Uniformly most powerful test (2 marks)
 - iii) Consistent (2 marks)
- c) Two red food coloring agents are compared for retention of colour in various solutions after various heat treatment with the following results

Solution	1	2	3	4	5	6	7	8	9	10
Agent A	4	4	5	1	3	3	5	6	6	3
Agent B	7	6	9	5	6	3	4	7	4	7

The records are scores on visual 10 point scale of colour scoring. Use Wilcoxon sign rank test to determine whether the two agents appear to differ or not at $\alpha = 0.02$ level of significance. (6 marks)

QUESTION THREE (20 MARKS)

- a) Clearly explain when Kendall's Tau statistic is applied (2 marks)
- b) Why Wilcoxon rank test statistic is considered as powerful as the ordinary sign test? (2 marks)
- c) Power of a test is the probability that the test statistic will lead to the rejection of H_0 . This is the probability of a correct decision and Power = 1 - Type II error. State and explain the variables that the power of a test depends on. (8 marks)
- d) To join the Machakos University for an economics course, it was a requirement that an aptitude test be administered out of 200 marks to prospective candidates. Results for some candidates were recorded as follows:
- 99, 123, 100, 90, 94, 135, 108, 107, 111, 133, 156,
106, 127, 119, 104, 127, 109, 117, 105, 125, 145, 184
- It is proposed that the median aptitude score for the sample is different from 127.
- Test this claim at $\alpha = 0.05$ and state the associated P value. (6 marks)
- e) What is the major difference between semi parametric tests and other tests? (2 marks)

QUESTION FOUR (20 MARKS)

- a) Explain the meaning of the following terms;
- i) Non-parametric Test (2 marks)
 - ii) P-value (2 marks)
 - iii) Order Statistic (2 marks)
- b) The following are measurements of the breaking strength of a certain kind of 2-inch cotton ribbon in pounds:
- 163 165 160 189 161 171 158 151 169 162
- 163 139 172 165 148 166 172 163 187 173
- Use the sign test to test the null hypothesis $M=160$ against the alternative hypothesis $M>160$ at the 0.025 level of significance (5 marks)
- c) Compare the one-sample sign test and the Wilcoxon signed rank test (3 marks)
- d) In choosing between two or more tests say A and B, explain your understanding of power of efficiency of A with reference to B. (6 marks)

QUESTION FIVE (20 MARKS)

- a) Perform a Chi- square test to investigate whether the following is drawn from a binomial (n, p) distribution with parameter p unknown. Use a 5% level of significance.

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

(10 marks)

- b) By first stating clearly the null and alternative hypothesis, apply the Wilcoxon rank- sum test at 1% level of significance to the following pair of samples.

A	88	75	92	71	63	84	55	64	82	96				
B	72	65	84	53	76	80	51	60	57	85	94	87	73	61

(10 marks)