MACHAKOS UNIVERSITY

University Examinations for 2021/2022 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF ECONOMICS AND FINANCE

EES 405: NON-PARAMETRIC AND SEMI PARAMETRIC STATISTICS

DATE: 10/12/2021 **TIME: 2.00-4.00 PM**

INSTRUCTIONS:

i) **Answer question ONE and any other TWO questions. Question one carries 30 marks and the other questions carry 20 marks each.**
ii) **Do not write on the question paper**

QUESTION ONE (30 MARKS)

a) The government hires its economists from two universities, A and B. A test is administered to a group of economists from the two universities and the entry scores recorded to determine if either university educates economist better. Conduct the Mann Whitney U-test at 5 percent level of significance. (10 marks)

A	97	69	73	84	76	92	90	88	84	87	93		
B	88	99	65	69	97	84	85	89	91	90	87	91	72

b) Explain any two assumptions of non-parametric tests. (4 marks)

c) Briefly describe when to use each of the following non-parametric methods

i. Kruskal Wallis test (2 marks)

ii. Kolmogrov-Smirnov test (2 marks)

d) Explain, giving examples the two decision errors that can arise in non-parametric tests (4 marks)

e) The weights of leaves produced by plants from the same original source after an experiment comparing two artificial day lengths I and II were as follows:

I	17.2	5.1	12.3	6.9	8.2	13.5	13.3	11.2	11.6	14.2	10.8	7.1	
II	19.0	15.3	12.4	17.5	12.8	13.0	14.6	10.6	6.7	9.3	15.8	16.8	10.1	19.1

Test the hypothesis of equal medians at $\alpha = 0.02$ level of significance. (8 marks)

QUESTION TWO (20 MARKS)

a) Highlight three examples of parametric and their corresponding non-parametric tests (6 marks)

b) Compare the one-sample sign test and the Wilcoxon signed rank test. (4 marks)

c) Explain the following concepts:

i) Level of significance (3 marks)

ii) Kernel regression (3 marks)

d) Compare the one-sample sign test and the Wilcoxon signed rank test. (4 marks)

QUESTION THREE (20 MARKS)

a) The government operates health centres in three locations. It monitors the number of patients on a daily basis. The following data relates to the number of patients visiting the three locations in a number of days. Test if the mean number of patients in the three heath centres is the same at a 5 percent level of significance. (12 marks)

Region 1	99	64	101	85	79	88	97	95	90	100
Region 2	83	102	125	61	91	96	94	89	93	75
Region 3	89	98	56	105	87	90	87	101	76	89

b) State and explain four main advantages of non-parametric tests over parametric tests (8 marks)

QUESTION FOUR (20 MARKS)

a) 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. (12 marks)

b) A company sells its products through a sales agent. The sales of the agent are thought to follow a binomial distribution with probability of making a sale being 0.45. If we examine the observed frequency of the sales agent for a week, can we conclude that the sales follow a binomial distribution at a 5% level of significance. (8 marks)

Number of sales per week	0	1	2	3	4	5	6	7
Frequency of the number of sales	25	32	61	47	39	21	18	12

QUESTION FIVE (20 MARKS)

a) Explain any two differences between parametric and non-parametric tests. (4 marks)

b) A planning manager ranked a number of workers according to their performance level and the number of years employed.

Performance rating	5	8	2	4	3	7	1	6
Number of years employed rating	1	6	5	2	7	8	4	3

i) Calculate the Spearman's rank correlation coefficient between performance rating and number of years employed rating. (8 marks)

ii) Test whether significant negative Spearman's rank correlation exists. (4 marks)

c) Differentiate between type I and type II errors in non-parametric statistics. (4 marks)