MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF ECONOMICS AND STATISTICS

EES 405: NON-PARAMETRIC AND SEMI PARAMETRIC STATISTICS

DATE: 22/10/2020 **TIME: 2:00 – 4:00 PM**

INSTRUCTIONS:

(i) Answer question one (Compulsory) and any other two questions

(ii) Do not write on the question paper

(iii) Show your working clearly

(iv) Where significance level is not given, use 5%.

(v) $H_{critical}=5.991$

QUESTION ONE (COMPULSORY) (30 MARKS)

a) Explain the differences between parametric and non-parametric tests (2 marks)

b) Explain merits for non-parametric tests (6 marks)

c) State three parametric and their corresponding non-parametric tests (3 marks)

d) What do you understand by the term 'level of significance?' (2 marks)

e) State any three assumptions of non-parametric test (3 marks)

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

g) The assessment for nine patients are as show in the table below.

Patient	1	2	3	4	5	6	7	8	9
Treatment A	36.3	48.4	40.2	54.7	28.7	42.8	36.1	39.0	36
Treatment B	35.1	46.8	37.3	50.6	29.1	41.0	35.3	39.1	36

Use the sign test to determine whether the data present sufficient evidence to indicate that one of the treatments tends to be consistently more efficient that the other, that is; $P(T_A>T_B)=0.5$.

(10 marks)

QUESTION TWO (20 MARKS)

a) The Kenya National Human Rights Commission (KNHRC) is interested in the relationship between different counties' average per capita income and their murder rate. A random sample of 8 counties produced the following values of average per capita income (in 1000 USD) and murder rate per 100,000 inhabitants;

Rate								

i. Calculate the Spearman's rank correlation coefficient between average per capita income and murder rate. (6 marks)

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

b) The data for the acidity levels of two chemicals per unit volumes are shown below. Do the data present sufficient evidence to indicate a difference in the acidity level? Test at $\alpha = 0.10$ level (10 marks)

Sample	1	2	3	4	5	6	7	8	9	10
Chemical A	1.21	1.43	1.35	1.51	1.39	1.17	1.48	1.42	1.29	1.4
Chemical B	1.49	1.37	1.67	1.50	1.31	1.29	1.52	1.37	1.44	1.53

QUESTION THREE (20 MARKS)

a) A poker dealing machine is supposed to deal cards at random as if from an infinite deck. In a test, you counted 1, 600 cards in each of the four suits: Hearts were 441, Spades were 404, Diamonds were 402 and Clubs were 353. Could it be that the suits are equally likely or are these discrepancies too much to be random? Use $\alpha = 0.05$ level (8 marks)

b) An Economics student from Machakos University randomly obtained a sample data for 8 classes. The median class is claimed to be 40.

23, 45, 34, 78, 34, 66, 61, 95

Using appropriate test, ascertain the claim at the $\alpha = 0.05$ level (8 marks)

c) Write clearly the steps of performing the Wilcoxon Signed Rank Test (4 marks)

QUESTION FOUR (20 MARKS)

a) Explain the meaning of the following terms;

i. Uniformly most powerful test (2 marks)

ii. Power of a test (2 marks)

b) Discuss four main advantages of non-parametric tests over parametric tests (8 marks)

c) 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 (8 marks)

QUESTION FIVE (20 MARKS)

a) 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 (10 marks)

b) Apply appropriate non-parametric test to determine whether different departments in Machakos University have different class sizes (10 marks)

Class Size (Maths, M)	**Class Size (Economics, E)**	**Class Size (Business, B)**
23	55	30
45	60	40
54	72	18
78	45	34
66	70	44