MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS

FOURTH YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF ECONOMICS AND FINANCE

BACHELOR OF ECONOMICS

EES 405: NON-PARAMETRIC AND SEMI PARAMETRIC STATISTICS

DATE: 11/8/2021 **TIME: 8.30-10.30 AM**

INSTRUCTIONS:

(i) Answer question one (Compulsory) and any other two questions
(ii) Do not write on the question paper

QUESTION ONE (COMPULSORY) (30 MARKS)

a) Differentiate between parametric test and non-parametric test (4 marks)

b) In order to reduce the number of mistakes made in computations by a team of 12 economists under the ministry of health, a training has been conducted. The number of mistakes made before and after the training has been documented and the data is given in table below:

Before	18	17	16	20	16	20	19	16	15	18	20	17
After	16	15	17	18	18	18	20	18	15	15	18	17

Evaluate the impact of this training using a sign test showing all the relevant steps. (8 marks)

c) The following table shows retail prices of three brands of a product. Use the Kruskal-Wallis test to determine if there is any difference in the retail prices of the product throughout the country at a 10 percent significance level.

Brand A	89	90	81	76	88	85	95	97	86	100
Brand B	78	93	87	89	71	90	96	82	85	
Brand C	80	88	85	79	80	84	85	90	92	

Use the Kruskal-Wallis test to determine if there is any difference in the retail prices of the product throughout the country at a 10 percent significance level. (7 marks)

d) Explain, giving examples the two advantages and disadvantages of non-parametric tests (5 marks)

e) The following scores are provided for 20 students for a given course;

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 (6 marks)

QUESTION TWO (20 MARKS)

a) The government operates health centers 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.

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

Test if the mean number of patients in the three heath centers is the same at a 5 percent level of significance. (12 marks)

b) State any three real life applications of this test. (3 marks)

c) The information tabulated below was recorded before and after tax in Kenya.

Before	33	36	41	32	39	47	34	29	32	34	40	42	33	36	29
After	35	29	38	34	37	47	36	32	30	34	41	38	37	35	28

Use an appropriate test to determine if there is a difference between the number of days required to collect a tax due before and after the introduction of a new tax policy. Use a 1% level of significance. (5 marks)

QUESTION THREE (20 MARKS)

a) A planning manager ranked a number of workers according to their performance level and the number of years employed. Test if the rank correlation coefficient is significant at a 5 percent significance level (10 marks)

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

Test the following hypothesis.

$H_0: \rho_s = 0$ *There is no correlation between the ranked data in the population*

$H_1: \rho_s \neq 0$ *There is a correlation between the ranked data in the population*

b) A manufacturer of a beauty product uses a machine to insert two types of reward (A and B) in all packets of the beauty product that are sold so as to encourage their customers to continue buying. The company would want randomness in the insertion of those rewards. A sample of 60 products show the following results

A	B	A	A	A	B	B	B	A	A	B	A
A	A	A	B	B	B	B	A	B	A	B	B
A	A	A	B	B	A	B	B	B	B	A	A
B	A	A	B	B	B	B	A	A	B	A	A
A	A	B	B	A	A	B	A	B	B	A	A

Carry out a run test to check for randomness in selecting the products. (10 marks)

QUESTION FOUR (20 MARKS)

a) Write short notes on the following tests of the following terms;

i. Kolmogolov Smirnov Test

ii. Run Test

iii. Parametric tests

iv. Semi-Parametric tests

v. Mood Median Test (10 marks)

b) Differentiate between the one-sample sign test and the Wilcoxon signed rank test (2 marks)

c) Given the following information:

GroupA-79,86,40,50,75,38,70,73,50,40,20,80,55,61,50,80,60,30,70,50

Group B-85,80,50,55,65,50,63,75,55,45,30,85,65,80,55,75,65,50,75,62

Test the following hypothesis at the significance Level $\alpha=0.05$ and One-tailed test (8 marks)

H_0: two categories' variables are independent.

H_1: two categories' variables are not independent.

QUESTION FIVE (20 MARKS)

a) The following example gives a table of observed frequency distribution and the expected frequency distribution under a normal distribution.

	Test score				
Class	51-60	61-70	71-80	81-90	91-100
Observed frequency	30	100	440	500	130
Expected frequency	40	170	500	390	100

Required

i. Calculate the K-S statistic (12 marks)

ii. Can we conclude that this distribution follows a normal distribution at a 10 percent level of significance? (3 marks)

b) Explain the application of Mood's test for independence. (5 marks)