



MACHAKOS UNIVERSITY

University Examinations 2019/2020 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

FOURTH YEAR SPECIAL /SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE IN STATISTICS AND PROGRAMMING

SST 403: NON-PARAMETRIC METHODS

DATE: 22/1/2021

TIME: 2.00-4.00 PM

INSTRUCTIONS

Answer question one and ANY TWO Questions

QUESTION ONE

- a) Explain any three situations when it is clear that the likely distribution of the outcome does not follow a normal distribution. (3 marks)
- b) Discuss any three reasons that make distribution free tests popular. (6 marks)
- c) State and explain any three classes of non-parametric statistics (6 marks)
- d) Discuss any three advantages of using non-parametric methods to make inferences? (6 marks)
- e) Discuss situations when parametric methods are not preferred to non-parametric methods. (6 marks)
- f) State any three Mann Whitney U Test assumptions (3 marks)

QUESTION TWO

- a) Discuss steps that are followed while conducting a statistical test using Kendall's Tau Correlation Coefficient (10 marks)
- b) Six Machakos university students were put on diet in an attempt to lose weight and in 3 months' period the following was the results.

Student	1	2	3	4	5	6
Weight Before, W_B	174	191	188	182	201	188
Weight After, W_A	165	186	183	178	203	181

Test whether the diet is an effective way of losing weight at 0.05 level of significance. (10 marks)

QUESTION THREE

- a) Assume you have been engaged as a consultant to examine that selections that are made to undertake some tests are random. Highlight the steps you will take to test that the selections are random (10 marks)
- b) A weather man made the following temperature forecasts and recorded the observations for 141 days as indicated in the table below:

Forecast Temperatures

Observed Temperatures		Low	Medium	High
	Low	34	24	17
	Medium	21	4	3
	High	23	9	6

Is there an association between the forecast rainfall and observed temperatures at 5% level of significance? ($\chi^2_{0.05,4} = 9.49$) (10 marks)

QUESTION FOUR

- a) Discuss the following:
- Median test (2 marks)
 - Steps undertaken while conducting median test (8 marks)
 - Assumptions made while conducting median test (3 marks)
- b) Show that the Spearman's Rank Correlation Coefficient, r_s , is given by:

$$r_s = 1 - \frac{6 \sum_{i=1}^n d_i^2}{n(n^2 - 1)} \quad (7 \text{ marks})$$

QUESTION FIVE

- a) A committee divided 36 million donations that was meant to support orphans by age groups as follows;

Age group	0-3	4-7	8-11	12-15	16-19	20-23	Total
Amount	13m	6m	0	3m	11m	3m	36m

Test whether the distribution was fair at 5% level of significance. ($\chi_{0.05,5}^2 = 11.07$)

(10 marks)

- b) A clinical trial to investigate the effectiveness of a new drug to reduce symptoms of typhoid was carried out on 10 children selected at random and placebo and new drug administered at random. Participants were asked to record the number of episodes they exhibited the symptoms over a 1 week period following receipt of the assigned treatment. The data are shown below.

Placebo	7	5	6	4	12
New Drug	3	6	4	2	1

Is there a difference in the number of episodes of symptoms over a 1 week period in participants receiving the new drug as compared to those receiving the placebo? (10 marks)