

CHUKA



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**EXAMINATION FOR THE AWARD OF DEGREE OF
BACHELOR OF SCIENCE IN ENVIRONMENTAL SCIENCE**

ENSC 261: STATISTICS FOR ENVIRONMENTAL SCIENCE

STREAMS: BSC (TOUR, WIEM, NARE) Y2S2

TIME: 2 HOURS

DAY/DATE: MONDAY 03/12/2018

11.30 AM – 1.30 PM

INSTRUCTIONS:

- **Answer ALL Questions in section A and any Two from Section B**
- **Do not write anything on the question paper**

SECTION A (30 MARKS)

1. The number of malaria cases and the population size in different towns in January were as given below:

Category	Nairobi	Eldoret	Meru	Kisumu
Cases	350	150	80	400
Population	3,500,000	550,000	150,000	380,000

- (a) Determine the proportion of the malaria cases of the total in each of the 4 towns. [2 marks]
- (b) Determine the ratio of malaria cases between the 4 towns [2 marks]
- (c) Determine the rate of malaria cases per 100,000 in each of the four towns. [2 marks]

2. In a given farm, the weights of sheep in a farm taken and recorded as shown below.

Weight	25	30	35	40	45	50	60
Frequency	15	12	18	20	14	8	2

Determine the mean absolute deviation.

[6 marks]

3. The concentration of lead in soil samples collected from Kiambu dumpsite is given below

Sample	A	B	C	D	E	F	G
Concentration (g/kg)	10	15	12	20	18	13	22

Determine the confidence interval of the mean at 95% confidence level. [6 marks]

4. Write short notes on questionnaires and schedules. [4 marks]

5. Differentiate between nominal and ordinal type of data. [4 marks]

6. The correlation coefficient between level of damage by pest in Mango trees and the total weight of fruits in each tree was determined to be 0.90. briefly explain the nature of the relationship represented by this value. [4 marks]

SECTION B (40 MARKS)

7. (a) The height (cm) of trees in five research plots with different treatments was taken every year for a maximum of eight years as shown below.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Plot 1	30	35	48	52	55	60	66	70
Plot 2	20	22	27	28	29	-	-	-
Plot 3	35	45	53	60	65	68	-	-
Plot 4	22	25	28	32	35	37	40	42
Plot 5	35	40	48	52	58	62	68	75

Perform an analysis of variance at 95% confidence level to determine whether there were significant differences in growth between the different research plots. [12 marks]

(b) In order to test whether a given regime of physical training was important in weight reduction, the weights of participants were taken before and after the training as shown below

Participant	A	B	C	D	E	F	G	H
Before	60	55	70	65	58	62	80	75
After	58	55	71	62	58	60	81	73

By use of Wilcoxon Matched-Pairs Signed-Ranks Test determine whether the training regime was significant in affecting the weight of participants. [8 marks]

8. (a) The weight of tomatoes harvested per plant for different watering regimes was observed and recorded as shown below

Water (ml)	20	25	30	35	40	45	50	55	60	65	70	75	80	85
Weight (g)	100	120	140	160	180	200	220	240	260	280	300	305	305	305

(i) Determine the correlation coefficient 'r' that represent the relationship between the two variables. [8 marks]

(ii) Determine whether the relationship is significant at 95% confidence level. [4 marks]

(b) Discuss any four biases that can affect the process of sampling. [8 marks]

9. (a) A drug that cures insomnia was tested on 12 participants. They were given the drug and then given a placebo to test the time they would take to fall asleep. The participants were required to count numbers until they fell asleep. The time taken is given below:

Participant	1	2	3	4	5	6	7	8	9	10	11	12
Placebo(min)	30	35	47	38	53	45	60	33	34	45	40	48
Drug (min)	10	15	20	28	22	26	24	14	20	10	16	27

using a paired t-test determine whether there is any significant difference between the drug and the placebo. [12 marks]

(b) Briefly discuss the procedure that should be followed in testing hypothesis. [8 marks]

Given $\frac{\sum f/x - \bar{x}/i}{n}, Cl = \bar{x} \pm (z \times se_m), t = \frac{\bar{D}}{\sqrt{\frac{s^2 D}{N}}}$

$$t = \frac{\bar{x}_1 - \bar{x}_2}{se_d}, MAD = i$$

$$r = \frac{N \sum XY - \sum X \sum Y}{\sqrt{[N \sum X^2 - (\sum X)^2][N \sum Y^2 - (\sum Y)^2]}}, t = r \sqrt{\frac{n-2}{1-r^2}}, S_2^D = \frac{\sum D^2 - \frac{(\sum D)^2}{N}}{N-1}$$