MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2017/2018

THIRD YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN ENVIRONMENTAL SCIENCE WITH INFORMATION TECHNOLOGY

MAIN CAMPUS

NES 303: ENVIRONMENTAL STATISTICS I

Date:20th February, 2018 Time: 8.30 - 11.30am

INSTRUCTIONS:

- Answer Question ONE and any other TWO
- Illustrate your answers with suitable examples, diagrams and figures wherever appropriate.

1. The data below show the mean concentration of the pollutant cadmium (in parts per million) in fifty streams.

54.7, 49.5, 56.2, 63.1, 54.8, 54.3, 55.7, 51.2, 56.6, 58.2, 54.5, 53.5, 54.2, 60.1, 59.7, 57.6, 56.2, 53.1, 53.1, 52.9, 56.4, 61.2, 57.3, 58.4, 50.3, 37.5, 45.6, 39.4, 46.7, 42.8, 43.6, 48.2, 44.5, 49.0, 50.6, 41.6, 38.8, 39.7, 41.6, 42.1, 44.3, 43.2, 48.9, 37.1, 45.3, 46.4, 47.1, 44.3, 43.7, 40.4

(a) Calculate the measures of central tendency and variability, and explain their advantages and limitations. [12 marks]

(b) Demonstrate graphical methods of exploring the data. [13 marks]

(c) With appropriate examples, explain the principles behind ground-based and remote sensing methods of environmental data acquisition. [5 marks]

2. The table below shows the mean soil depth in centimeters from 84 sample sites in a forest ecosystem.

100	99	97	96	95	90	89	88	87	85	85	84	82	81
79	77	78	76	76	75	74	74	73	72	71	70	69	69
66	66	65	64	63	62	61	59	59	58	57	57	57	56
55	55	54	53	52	51	50	49	49	49	49	49	48	48
46	46	46	45	43	43	42	41	40	39	39	39	38	38
35	34	33	32	31	30	29	28	27	25	24	22	21	20

(a) Explain the principles governing conversion of raw scores into grouped scores. [4 marks]

(b) Draw appropriate graphic representation of frequency distribution [16 marks]

3. The number of bird species in 24 counties in Kenya is given below.

5470, 4950, 5623, 6314, 5480, 5435, 5570, 5128, 5660, 5822, 5451, 5358, 5420, 6012, 5763, 5620, 5313, 5311, 5290, 5642, 6124, 5730, 5842, 5035

(a) Make a back-to- back stem and leaf plot of populations. [7 marks]

(b) Describe the distribution of the data and the application of stem and leaf plot in environmental data analyses. [6 marks]

(c) The concentration of phosphate in five streams has a mean of 10ppm and standard deviation of 2ppm. Using the 68%- 95%- 99.7% rule for normal distributions, calculate and illustrate the lowest and highest concentrations. [7 marks]

4. (a) The following table shows the population of Giraffe in National Parks in Kenya.

National Park	Population of Giraffe
Nairobi	200
Masai Mara	210
Tsavo East	160
Tsavo West	170
Amboseli	180
Samburu	140
Meru	130
Ruma	100
Lake Nakuru	250
Bufallo Springs	120

Draw appropriate graphic representation to show the relationship between National Park and the population of the Giraffe. [8 marks]

(b) The table below shows the body weights of small herbivores and their age in months. In order to make statistical inference, the data must be normally distributed and hence the normality must be tested.

Body weight (kg)	Age (months)	Frequency
59.5– 62.5	61	5
63.5– 65.5	64	18
66.5– 68.5	67	42
69.5– 71.5	70	27
72.5– 74.5	73	8

Calculate the skewness and kurtosis, and interpret the results. [12 marks]

5. (a) The table below shows data relating cases of brick making to cases of land degradation.

	Excavation of soil	Clear cutting of trees
Gully erosion	900	200
Decline in soil fertility	100	800

(i) Calculate statistical association between cases of brick making and cases of land degradation. [4 marks]

(ii) Explain the implications of the associations. [3 marks]

(b) The table below shows data relating cases of land pollution and income class. Calculate statistical association between land pollution and income class; explain the implications of the associations. [13 marks]

Land Pollution	Low income	Middle income	High income
High	200	400	700
Medium	500	900	400
Low	800	300	100