



MASEÑO UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

FIRST YEAR SECOND SEMESTER EXAMINATIONS FOR
THE DEGREE OF MASTER OF SCIENCE IN
ENVIRONMENTAL SCIENCE
(HOMABAY CAMPUS)

NES 828: ENVIRONMENTAL SYSTEMS ANALYSIS

Date: 22nd April, 2012

Time: 9.00 – 12.00 noon

INSTRUCTIONS:

- ♦ Answer ANY FOUR questions.

1. (a) Explain why knowledge of environmental systems analysis is a must to 21st century development goals (5 marks)
- (b) Discuss the characteristics of cost benefit analysis as a tool for environmental systems analysis. (5 marks)
- (c) What are the problems in applying cost-benefit analysis? (5 marks)

2. A biologist investigating the usefulness of plecoptera (stonefly) nymphs as indicators of environmental factors in streams. Samples from 13 streams are obtained by displacing nymphs from a stream bed into a net by means of a standardized kick technique values of water hardness calcium carbonate concentration are obtained from the local water authority.

Stonfly nymphs and water hardness

Variable x Water hardness (CaCO ₃ units)	Rank of x	Variable y Number of Plecoptera nymphs	Rank of y
17	1	42	13
20	2	40	12
22	3	30	11
28	4	7	6
42	5	12	10
55	6 ½	10	9
55	6 ½	8	8
75	8	7	6
80	9	3	2
90	10	7	6
145	11 ½	5	4
145	11 ½	2	1
170	13	4	3

Is there a significant correlation between water hardness and number of plecoptera nymphs? (15 marks)

3. Environmentalist wishes to know if the mean masses of starlings sampled in four different roost situations are different. A sample of 10 units (starlings) is obtained from each situation as in the table below:-

Situation 1 Sample 1	Situation 2 Sample 2	Situation 3 Sample 3	Situation 4 Sample 4
78	78	79	77
88	78	73	69
87	83	79	75
88	81	75	70
83	78	77	74
82	81	78	83
81	81	80	80
80	82	78	75
80	76	83	76
89	76	84	75

Compute one-way ANOVA (15 marks)

4. (a) Discuss the strategic environmental assessment as an environmental systems analysis tools (7 marks)

(b) Compare and contrast environmental impact assessment and strategic environmental assessment. (8 marks)

5. A sample of 10 fish of one species is randomly selected from a fishing boat. Each fish is weighed and measured and data is as shown on the table below.

Otolith and fish length measurements

Otolith Length X (mm)	Fish mass y (g)
6.6	86
6.9	92
7.3	71
7.5	74
8.2	185
8.3	85
9.1	201
9.2	283
9.4	255
10.2	222

Calculate the product moment correlation coefficient?

(15 marks)

6. Write short notes

(a) Emergy

(5 marks)

(b) Exergy

(5 marks)

(c) Positional analysis

(5 marks)