UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER 2016/17

TITLE OF PAPER: ECOLOGICAL TECHNIQUES I

COURSE CODE: BIO603

TIME ALLOWED: THREE HOURS

INSTRUCTIONS:
1. THE EXAMINATION HAS FOUR (4) QUESTIONS. ANSWER ANY THREE (3).
2. EACH QUESTION CARRIES 30 MARKS.
3. ILLUSTRATE YOUR ANSWERS WITH LARGE AND CLEARLY LABELLED DIAGRAMS WHERE APPROPRIATE.

SPECIAL REQUIREMENTS: NONE

THIS PAPER IS NOT TO BE OPENED UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATORS

QUESTION 1

You have been given the task of estimating the population sizes of 13 species of endangered birds inhabiting savanna habitats in a protected area in Swaziland. Give a detailed account of how you would:

(a) collect the relevant data,

(b) analyze the data to get estimates of population sizes.

State and explain the assumptions and biases involved in your methods.

[30 Marks]

QUESTION 2

"Camera trapping is not a useful technique for assessing the presence of elusive species because they are rarely recorded". Critically discuss and evaluate this statement.

[30 Marks]

QUESTION 3

What are the pros and cons of using a "model selection" approach to conducting ecological research with respect to "traditional" statistics (that use a P-value to decide whether the null hypothesis should be rejected or not). Use the functionality of the program MARK to illustrate your answer.

[30 Marks]

QUESTION 4

Results below are outputs from four modules in PRIMER v5 from a field experiment where ants were sampled using pitfall traps at two localities, i.e. Middleveld (M) and Lowveld (L) of Swaziland. Distinguish between the modules and discuss the results thereof.

i. Rank abundance curve

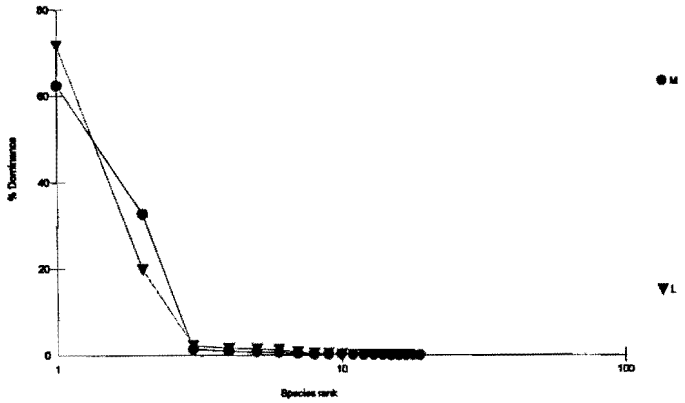

Figure 1. Species rank abundance curve for ants collected from both sampling locations. M = Middleveld, L = Lowveld

ii. SIMPER

Parameters
Cut off for low contributions: Top 4 species
Factor name: Location

Factor groups
Middleveld and Lowveld

Group Middleveld
Average similarity: 47.65

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Myrmicaria natalensis	632.83	29.16	2.71	61.20	61.20
Anoplolepis custodiens	330.92	4.09	0.57	8.59	69.79
Polyrhachis schistacea	6.25	3.28	0.56	6.89	76.68
Pheidole sp	7.33	2.60	0.67	5.46	82.14

Group Lowveld
Average similarity: 63.41

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Myrmicaria natalensis	233.33	32.19	3.65	50.76	50.76
Pheidole	64.58	11.41	1.70	17.99	68.75
Anoplolepis custodiens	5.25	6.45	1.66	10.17	78.92
Camponotus AFRC_za12	7.17	4.49	0.90	7.08	86.00

Groups Middleveld & Lowveld
Average dissimilarity = 51.61

Species	Group M Av.Abund	Group L Av.Abund	Av.Diss	Diss/SD	Contrib%	Cum.%
Anoplolepis custodiens	330.92	5.25	6.93	1.39	13.42	13.42
Pheidole	7.33	64.58	6.75	1.53	13.07	26.49
Myrmicaria natalensis	632.83	233.33	4.07	1.23	7.89	34.38
Polyrhachis schistacea	6.25	0.75	3.96	1.05	7.66	42.05

iii. Cluster Analysis

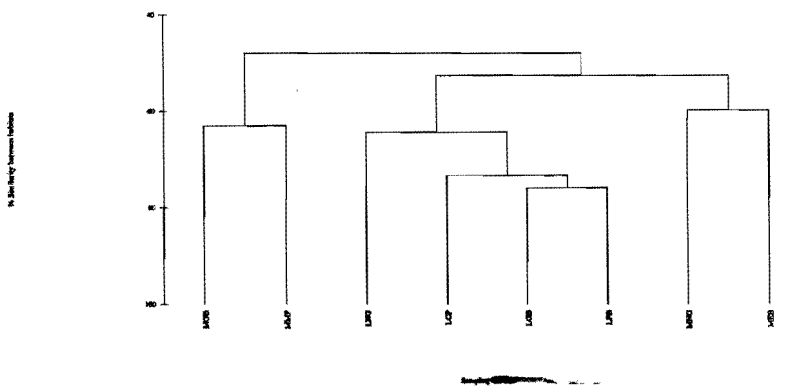

Figure 2. Dendogram showing similarity in ant species distribution between sampling habitats, where M=Middleveld, L=Lowveld, GB=Grassborder, MP=Maize plot, NG=grassland, CP=Cotton plot, GB=Grassborder, PB=Pine border, EB=Eucalyptus border

iv. Principal Component Analysis

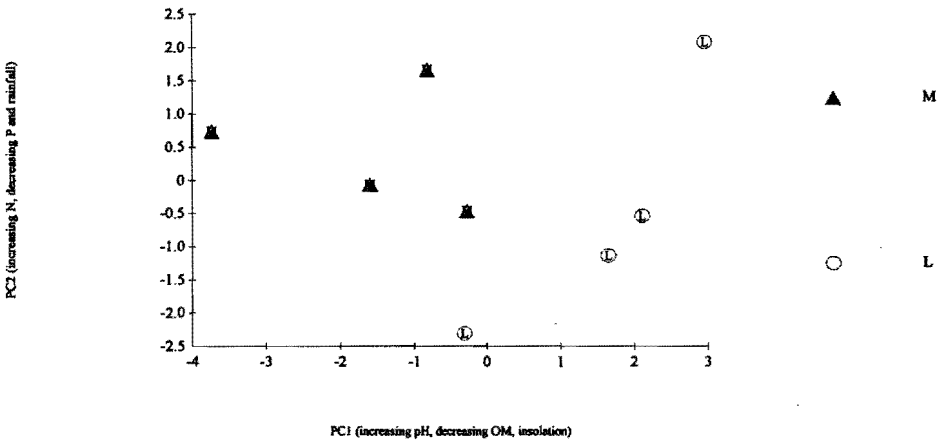

Figure 3. PCA for environmental variables measured at the two sampling locations where OM=organic matter, N=nitrogen, P=Phosporus

[30 Marks]