JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE & TECHNOLOGY

SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES

UNIVERSITY EXAMINATION FOR THE DEGREE OF MASTER OF SCIENCE IN PLANT ECOLOGY

1ST YEAR 2ND SEMESTER 2016/2017 ACADEMIC YEAR

MAIN CAMPUS - REGULAR

COURSE CODE: **SBT 802**

COURSE TITLE: **BIOMETRY, EXPERIMENTATION AND METHODS**

EXAM VENUE: **STREAM: (MSC)**

DATE: **EXAM SESSION:**

TIME: 3 HOURS

Instructions:

1. **Attempt ALL questions in Section A and Any two questions in Section B**
2. **Candidates are advised not to write on the question paper**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room**

SECTION A: SHORT ANSWER QUESTIONS (30 MARKS)

1. a) List four assumptions that must be considered before applying multiple regression in biostatistics. (4 marks)

b) The following Climate data was obtained from nine randomly selected days of the month:

Day	29	15	3	24	5	16	7	6	9
Rainfall	150mm	200mm	400mm	120mm	93mm	55mm	170mm	350mm	100mm

From this sample data, calculate the standard deviation and the variance. (4 marks).

c) i) Explain your understanding of the term probability (1 mark)

ii) Assuming you have total of 85 cards, which are distributed as follows: Blue (40), Green (20), Yellow (15), Red (10). If the cards are randomly mixed, what is the probability of: i) Picking red or green? ii) Neither blue nor green? . (6 marks)

iii)In a 144 rolls of a die, a 6 is obtained 32 times. Does this cast doubt on the honesty (balance) of the die. (Z=1.78) (3 marks)

d) Suppose two ecologist test the same hypothesis using the same data.

i)Can they reach different conclusion. (1 mark)

ii)Assuming that the procedures used by the two ecologists are correct, explain why they may reach different conclusions. (2 marks)

iii) State important consideration when setting a hypothesis. (3 marks)

e) i)Relate the concepts of interval estimation and hypothesis testing. State the types of errors that a confidence interval can cause. (3 marks)

ii) Using relevant examples, differentiate between one way and two way ANOVA. (3 marks)

SECTION B: ESSAY QUESTIONS (30 MARKS)

Q2.

An experiment was carried out to determine the performance of local maize on new fertilizer variety. Out of 200 farmers who used the new fertilizer, 20% of participants did not report any improvement in yield.

a)What is the 99% confidence interval for the proportion of farmers who would still not report any improvement if they used the new fertilizer. (6 marks)

b) Assuming the same sample of size n = 200 produced the sample mean of X= 54. Assuming the population standard deviation = 15, compute a 95% confidence interval for the population mean. (3 marks).

c) Write an essay on three random sampling techniques. (6 marks)

Q3.

The following data was obtained in a trial experiment on the effects of bacterial decomposition rates of sewage sludge.

Trial	A	B	C	D	E	F	G
Bacteria Load (x)	12	19	8	9	15	3	14
Decomposition (%) rates (y)	30	45	27	39	49	32	51

Using the following data: bacterial load as X values and decomposition rates as Y values.

a) Find the equation for the regression of X on Y? Interpret your results. (6 marks)

b) Find the 95% confidence interval for the slope (3 marks)

c) Determine the coefficient of variation (CV). (3 marks)

d) Test the null hypothesis that there is no relationship between bacterial load and decomposition rate (3 marks).

Q4.

A study was carried out to determine the effects of nutrients in grams on cereal productivity. The results were as follows:

replicate	Yield			Nutrients		
	Plot A	Plot B	Plot C	Plot A	Plot B	Plot C
1	26.7	17.7	58.3	6.6	8.5	7.5
2	36.5	29.3	72.3	7.1	5.6	6.3
3	28.3	14.2	95.3	4.3	5.2	8.5
4	46.4	23.5	88.7	3.9	6.2	4.2
5	42.5	35	61.3	5.7	6.9	8.9
6	14.7	54.7	57a	7.5	8.2	7.2

From the data, find:

a) Mean and variance for yield and nutrients in each plot (6 marks)

b) Determine the correlation coefficient (r) for the three plots and interpret your results (9 marks).

Q5.

In an experiment performed for a single factor ANOVA (analysis of variance) in Excel where the null hypothesis was tested that the means of several populations are all equal.

H_0: $\mu_1 = \mu_2 = \mu_3$

The following output was generated:

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Fungi	8	244	30.5	405.42857
Baceteria	8	254	31.75	500.21429
Virus	8	413	51.625	595.41071

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	2247.58	2	1123.7917	2.2460058	0.13063	3.4668
Within Groups	10507.4	21	500.35119			
Total	12755	23				

a) Interpret the output: (12 marks)

b)Assuming that at least one of the means is different, how would tell where the difference lies.

(3 marks)