



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE & TECHNOLOGY**

**SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES**

**UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN  
BIOLOGICAL SCIENCES**

**FOURTH YEAR FIRST SEMESTER 2018/2019 ACADEMIC YEAR**

**MAIN CAMPUS - REGULAR**

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**COURSE CODE: SBT 3415**  
**COURSE TITLE: BIostatISTICS II**

**EXAM VENUE: STREAM: (BIO)**

**DATE: EXAM SESSION:**

**TIME: 2 HOURS**

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**Instructions:**

- 1. Answer ALL questions in Section A and Any two questions in Section B**
  - 2. Candidates are advised not to write on question paper**
  - 3. Candidates must hand in their answer booklets to the invigilator while in the examination room**
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**SECTION A: SHORT ANSWER QUESTIONS (30 MARKS)**

1. State assumptions that must be considered before applying multiple regression in biostatistics. (3 marks)
2. Assuming a normal distribution, use a diagram to explain your understanding of Confidence interval and standard deviation. (3 marks)
3. Differentiate between one way and two way ANOVA (analysis of variance). (3 marks)
4. A random sample of 20 BSc Biological Sciences students at JOOUST revealed that only 10 were comfortable with Molecular Biology option. Provide an approximate 95% confidence interval for that proportion in the BSc programme. (3 marks)
5. 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)
6. The following data on weight of 15 randomly selected BSc Biological Science students were measured in kilograms: {70, 90, 42, 58, 62, 43, 49, 57, 39, 60, 45, 61, 74, 55, 81}. From this data, calculate the standard deviation and the variance. (3 marks)
7. Using relevant examples, differentiate between type 1 and type 2 errors. (3 marks).
8. The following are random balls provided by a betting company for the lotto game in two drums;

Teams	Yellow	Pink	Red	Black	White
Drum A	13	10	9	7	12
Drum B	7	20	8	6	8

If the balls are randomly mixed, and one ball is picked simultaneously from each drum, what is the probability of:

- a) Picking black or Pink balls? (1.5 mark)
  - b) Neither picking white nor yellow balls? (1.5 mark)
9. Assuming the mean height of BSc Biological Science female students is 160cm with a standard deviation of 10. What is the probability of finding a random sample of 30 female students with a mean height of 180 cm, assuming the heights are normally distributed? Explain your answer. (3 marks)
  10. The following data represents performance verses the time allocated in the SBI 3415 Biostatistics II for a random sample of 4<sup>th</sup> year students.

Score (%)	80	75	60	45	50	55	65	40	5
Time(Minutes)	40	20	25	10	15	12	20	10	5

- a) Assuming the score is depended on time allocated by each student, find the 95% confidence interval for the slope (3 marks)

**SECTION B: ESSAY QUESTIONS (40 MARKS)**

11. A study was carried out to test the effects of rainfall on microbial decomposition rate. The following data was obtained:

Rainfall (mm)	5	8	6	9	12	15
Decomposition rate (%)	25	30	35	40	45	45

From these data:

- a) Plot a scatter diagram and a line of fit showing the y-intercept and the slope. (10 mark)
- b) Determine the standard error of the estimate and confidence interval for the slope. (10 marks)

12. 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, 30% 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  $\mu = 54$ . Assuming the population standard deviation = 15, compute a 95% confidence interval for the population mean. (4 marks).
- c) Given the following data was obtained from two random farms above. Test the hypothesis that there is no relationship between Farm A and B at  $P < 0.05$ , assuming unequal variance. (10 marks)

Trial	A	B	C	D	E	F	G
Farm A	12	19	8	9	15	3	14
Farm B	30	45	27	39	49	32	51

13. The following data indicates the number of maize bags obtained when DAP fertilizer was used in a farm in Bondo sub-County under varying moisture regimes.

Amount of DAP (Kg)	20	25	30	35	40	45	50	55	60	65
Soil Moisture (L)	10	15	20	25	30	20	35	40	35	45
Bags of Maize	15	14	30	42	50	45	60	70	65	70

- a) Using this data, determine the multiple linear regression equation. Explain your equation. (10 marks).
- b) Compute the proportion of the variance due to regression (R square) (6 marks).
- c) Test the significance of  $R^2$ . (4 marks)

14. 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:

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Microbe A	6	143	23.83333	142.1667
Microbe B	6	88	14.66667	12.66667
Microbe C	6	128	21.33333	32.66667

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	269.4444	2	134.7222	2.155556	0.150359	3.68232
Within Groups	937.5	15	62.5			
Total	1206.944	17				

From the data:

- Explain the above output. (10 marks)
- Assuming that at least one of the means is different, how would you tell where the difference lies. (4 marks).
- Write an essay on two sampling techniques (6 marks)