JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE & TECHNOLOGY

SCHOOL OF BIOLOGICAL, PHYSICAL, MATHEMATICS AND ACTURIAL SCIENCES

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

FOURTH YEAR FIRST SEMESTER 2021/2022 ACADEMIC YEAR

MAIN CAMPUS - REGULAR

COURSE CODE: SBB 1409

COURSE TITLE: BIOSTATISTICS II

EXAM VENUE: ZOO LAB   **STREAM: (BSc)**

DATE: 6/12/2022   **EXAM SESSION: 9.00-11.00AM**

TIME: 2 HOURS

Instructions:

1. **Answer ALL questions in Section A and Any two questions selected from 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**

SECTION A: SHORT ANSWER QUESTIONS (30 MARKS)

1. Using diagrams, illustrate the null hypothesis for left hand, right hand and two tail test
    (3 marks)
2. Citing relevant examples, differentiate between Type I and Type II errors   (3 marks)
3. Explain the application differences between frequency and probability distribution
    (3 marks)
4. State the theory of test of significance considered when dealing with small and large
    sample sizes.   (3 marks)
5. Explain the importance of Correlation analysis and standard error in statistics
    (3 marks)
6. State assumptions that must be considered before applying multiple regression in
    biostatistics   (3 marks)
7. Assuming a normal distribution, use a diagram to explain your understanding of
    confidence interval and standard deviation at α of 5%.   (3 marks)
8. Differentiate between one-way and two - way ANOVA (analysis of variance)
    (3 marks)
9. A random sample of 16 BSc Biological Science students at JOOUST revealed that only 9
    passed Biostatistics course unit. Provide an approximate 99% confidence interval for that
    proportion in the BSc program   (3 marks)
10. Assuming the mean height of BSc Biological Science female students is 150 cm with a
    standard deviation of 10. What is the probability of finding a random sample of 30 female
    students with a mean height of 160 cm, assuming the heights are normally distributed?
    (3 marks)

SECTION B: ESSAY QUESTIONS (40 MARKS)

11. A Social Science student wanted to determine the effect of online teaching (OT) on the
    students' performance in exams compared to physical teaching (PT). Based on this
    information, answer the following questions
a) State a suitable hypothesis for the above study   (2 marks)
b) Describe the type of data she will collect and describe experimental design used to collect
    the data   (5 marks)
c) Assuming the study was carried and the following data was obtained.

Students	A	B	C	D	E	F	G
OT	40	42	50	45	49	55	52
PT	50	52	55	58	60	62	70

   I.   Calculate the Standard Error of the mean performance   (4 marks)
  II.   Perform a statistical test based on your data above (assume 95% confidence interval)
    (9 marks)
12. An experiment was carried out to determine the health performance of women on new
    Slimming belt. Out of 100 women who used the new belt, 20% of participants did not
    report any improvement in weight.
    a) What is the 95% confidence interval for the proportion of women who would still not
    report any improvement if they used the new belt.   (5 marks)

b) Assuming the same sample of size n = 100 produced the sample mean of μ= 30. Assuming the population standard deviation = 15, compute a 95% confidence interval for the population mean. (5 marks).

c) Given the following reduction in weight (Kg) was obtained from two random women groups for seven (7) months.

Months	J	F	M	A	M	J	J
Group A	2	5	8	8	5	7	10
Group B	3	5	7	6	9	5	8

Determine the correlation coefficient and explain your answer. (10 marks)

13. The following data indicates the number of coliform colonies obtained when media x was used in Zoology lab under varying moisture.

moisture	10	15	20	25	30	35	40	45	50	55
Coliforms (#)	5	6	10	15	16	18	20	25	28	30

a) Using this data, determine the regression equation. Explain your equation. (10 marks).

b) Draw a scatter plot and compute the proportion of the variance due to regression (r^2) (10 marks).

14. The following output was generated 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.

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

SUMMARY

Groups	Count	Sum	Average	Variance
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

Source of Variation	SS	Df	MS	F	P-value	F crit
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:
a) Explain the above output. (8 marks)
b) Describe three non-parametric tests (12 marks)