

UNIVERSITY EXAMINATIONS

1ST SEMESTER 2022/2023 ACADEMIC YEAR

THIRD YEAR EXAMINATION FOR THE DEGREES OF
BACHELOR OF EDUCATION (SCIENCE), BACHELOR
OF SCIENCE (GENERAL)

BOTA 311: BIOSTATISTICS

STREAM: R

TIME: 2 HRS

DAY: WED [8.30AM – 10.30AM]

DATE: 07/12/2022

THIS QUESTION PAPER CONSISTS OF FOUR (4) PAGES

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INSTRUCTIONS: - Answer ALL questions in Section A and any TWO questions in Section B

SECTION A: 40 MARKS

QUESTION ONE

Explain the meaning of each of the following methods of data collection

- (i) census
 - (ii) Sample survey
 - (iii) Experiment
 - (iv) Observational study
- (4 marks)

QUESTION TWO

(a) If 20% of the bolts produced by a machine are defective, determine the probability that, out of 4 bolts chosen at random, (a) 1, (b) 0, and (c) at most 2 bolts will be defective. (6 marks)

(b) Ten percent of the tools produced in a certain manufacturing process turn out to be defective. Find the probability that in a sample of 10 tools chosen at random exactly 2 will be defective by using the Poisson approximation. (3 marks)

QUESTION THREE

A student's final grades in mathematics, physics, English and hygiene are, respectively, 82, 86, 90 and 70. If the respective credits received for these courses are 3, 5, 3, and 1, determine an appropriate average grade. (3 marks)

QUESTION FOUR

A simple linear relationship between two variables X and Y were found to have the estimated linear regression equation of $y = 0.85 + 0.44x$, If $n=16$; $S^2_{y.x} = 0.88$ and $\sum x^2 = 210$, test for the significance of the regression coefficient (5 marks)

QUESTION FIVE

A teacher wishes to test three different teaching methods: I, II, and III. To do this, three groups of five students each are chosen at random, and each group is taught by a different method. The same examination is then given to all the students, and the grades in the table below are obtained. Using Kruskal Wallis test, determine whether there is a difference between the teaching methods at significance levels of (a) 0.05 and (b) 0.01. (6 marks)

Method I	75	62	71	58	73
Method II	81	85	68	92	90
Method III	73	79	60	75	81

QUESTION SIX

The intelligence quotients (IQs) of 16 students from one area of a city showed a mean of 107 and a standard deviation of 10, while the IQs of 14 students from another area of the city showed a mean of 112 and a standard deviation of 8. Is there a significant difference between the IQs of the two groups at significance levels of (a) 0.01 and (b) 0.05? (6 marks)

QUESTION SEVEN

A professor has two classes in psychology: a morning class of 9 students, and an afternoon class of 12 students. On a final examination scheduled at the same time for all students, the classes received the grades shown in the table below. Can one conclude at the 0.05 significance level that the morning class performed worse than the afternoon class? Work the problem, supplying all the details for the Mann–Whitney U test. (7 marks)

Morning class	73	87	79	75	82	66	95	75	70			
Afternoon class	86	81	84	88	90	85	84	92	83	91	53	84

SECTION B: ANSWER ANY TWO QUESTIONS (30 MARKS)**QUESTION EIGHT**

(a). Mendel raised 929 plants from self-fertilization of plants heterozygous for flower colour. 705 were coloured and 224 were white flowers. Are these numbers of offsprings consistent with hypothesis of 3:1 coloured: white ratio. (5 marks)

(b). Of a group of patients who complained that they did not sleep well, some were given sleeping pills while others were given sugar pills (although they all thought they were getting sleeping pills). They were later asked whether the pills helped them or not. The results of their responses are shown in the table below. Assuming that all patients told the truth, test the hypothesis that there is no difference between sleeping pills and sugar pills at a significance level of 0.05. (10 marks))

	Slept Well	Did Not Sleep Well
Took sleeping pills	44	10
Took sugar pills	81	35

QUESTION NINE

The table below shows [in inches (in)] the respective heights X and Y of a sample of 12 fathers and their oldest sons.

Height X of father (in)	65	63	67	64	68	62	70	66	68	67	69	71
Height Y of son (in)	68	66	68	65	69	66	68	65	71	67	68	70

- (a) Find the least-squares regression line of the height of the father on the height of the son
- (b) What are the correlation coefficient and the regression coefficient for the height of the father on the height of the son?
- (c) Test the significance of β (in the regression coefficient) using t test (15 marks))

QUESTION TEN

During one semester a student received grades in various subjects, as shown in the table below. Using one-way ANOVA, determine whether there is a significant difference between the student's grades at the (i) 0.05 and (ii) 0.01 levels. (15 marks))

Mathematics	72	80	83	75	
Science	81	74	77		
English	88	82	90	87	80
Economics	74	71	77	70	