

**GWANDA STATE UNIVERSITY**



**FACULTY OF LIFE SCIENCES**

**DEPARTMENT OF CROP SCIENCE**

**BACHELOR OF SCIENCE HONOURS DEGREE IN CROP SCIENCE**

**INTRODUCTION TO STATISTICS**

**LCS 1207**

**Second Semester Final Examination Paper**

**AUGUST 2021**

This examination paper consists of 3 pages

**Time Allowed:** 3 hours  
**Total Marks:** 100  
**Special Requirements:** None  
**Examiner's Name:** MISS A BANDA

**INSTRUCTIONS**

1. Answer **all** questions in Section A
2. Answer **TWO (2)** questions in Section B

**MARK ALLOCATION**

<b>QUESTION</b>	<b>MARKS</b>
SECTION A	60
SECTION B	40
<b>TOTAL ATTAINABLE MARKS</b>	<b>100</b>

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**SECTION A ANSWER ALL QUESTIONS IN THIS SECTION**

**QUESTION 1**

a. Define quantitative and qualitative data

[4]

b. Give three advantages and three disadvantages of each data type

[6]

c. The percentage time spent on different activities (time budget) by feral nanny and billy goats during a rut is presented below.

	Activity				
	Feeding	Lying	Standing	Walking	Social/ sexual
Nannies	67	24	5	2	2
Billies	34	41	10	5	10

Calculate the corresponding degrees of the percentages and there after draw pie charts for (i) nannies (ii) billies

[10]

**QUESTION 2**

2. a. Define three main measures of central tendency

[6]

b. The number of wood ants captured in nine (9) pitfall traps set overnight in deciduous woodland is:

2    5    3    5    4    5    3    6    10

Calculate (i) the mean number of ants per trap

[3]

(ii) median number of ants

[3]

(iii) state the mode number of ants

[1]

c. Name the three measures of variability and compute them using the data given in b.

[7]

### QUESTION 3

3. Many species of rodents (muridae) contain in their heads a pair of characteristic “ear-stones” called otoliths. These resist absorption in digestive tracts and may be found in cat’s faeces and bats droppings. If a good correlation were found to exist between the length of otoliths and a variable such as the mass or length of the rodents from which they came from, then the Animal scientists would be able to draw inferences about the diets of cats or bats from otoliths found in faeces or droppings.

A sample of 10 rodents of one species is randomly selected from a box on a random removal trapping activity. Each rodent is weighed and measured and then dissected to remove the otoliths, which are also measured. It is assumed these variables are normally distributed within the population from which the sample is drawn. The data are tabulated in Table 1 as set of bivariate data. The otolith measurements may be regarded as the mean of the pair obtained from each rodent.

Table 1 otolith length and rodents mass measurements

Otolith length x (mm)	6.6	6.9	7.3	7.5	8.2	8.3	9.1	9.2	9.4	10.2
Rodents mass y (g)	86	92	71	74	185	85	201	283	255	222

a. Calculate

(i)  $\Sigma x$ ,  $\Sigma y$ ,  $(\Sigma x)^2$ ,  $(\Sigma y)^2$ ,  $\Sigma x^2$ ,  $\Sigma y^2$ ,  $\Sigma xy$

[10]

(ii) Product moment correlation coefficient (r) and comment on it

[4]

b. Draw a scattergram and comment on the correlation

[6]

### SECTION B ANSWER ONLY TWO QUESTIONS

### QUESTION 4

4a. How did the theory of probability arise and what does it reflect?

[2]

b. Long-term studies of a pond community have shown that it is inhabited by only two species of meniscus midge (Diptera: Culicoidae), namely *Culicoides sonorensis* and *Culicoides mississippiensis*. The pupae, which are indistinguishable and are dispersed randomly and independently in the habitat, are collected from emergent vegetation just above the water line, and emerge as adults within a few days in captivity. On basis of very large samples it is known that on average 80 out of every 100 pupae collected will emerge as *C. sonorensis* and the remainder as *C. mississippiensis*. It is also known that, on average, insects emerge in the ratio 1:1 males to females, i.e. 1 out of every 2 is a male, and the other a female. We will assume, for illustrative purpose, that there is negligible mortality during pupation, and that an 'event' is the hatching of a pupa which has been selected at random.

(i) What is the probability that the outcome of an event is *C. sonorensis*?

[2]

(ii) What is the probability that the outcome of an event is *C. mississippiensis*?

[2]

(iii) What is the probability that the outcome of an event will be a male?

[2]

c.(i) In case that the probability of a mosquito male insect emerging from pupa selected at random is 0.5, what is the probability that 4 pupae will result in 1 male and 3 females? Represent the probability of being male as  $p$  and that of being female as  $q$ .

(ii) With relation to the above question compute the complete probability distribution of all combinations for  $k=8$  when  $p=0.5$  and add up the probabilities.

[12]

## QUESTION 5

5a. Draw and state the characteristics of a normal distribution curve

[8]

b. On the basis of a very large samples the mean ( $\mu$ ) height of a population of seedlings is estimated to be 3.8mm and  $\sigma$  is estimated to be 0.15mm. Is it likely that a randomly selected seed of height 4.3mm belongs to this population? Use  $\alpha$  at 0.05

[6]

c. A sample of 12 spikelets of a species of meadow grass (*Poa* sp.) is obtained randomly from different flower heads. The lengths of the spikelets are (mm):

4.5, 4.9, 6.6, 5.3, 5.2, 6.1, 5.4, 6.2, 5.2, 4.7, 5.6, 5.5

A single meadow found loose in a herbarium measures 4.4 mm. Is it likely that this specimen represents a population with the same mean as that from which the sample is drawn?

[6]

### **QUESTION 6**

6a. Define

Statistical test

[1]

Hypothesis

[1]

Null Hypothesis

[1]

Alternative hypothesis

[3]

Two tailed test

[2]

Type 1 error

[1]

Type 2 error

[1]

Power test

[1]

b. Distinguish between non-parametric and parametric test

[10]

**END OF EXAMINATION**