GWANDA STATE UNIVERSITY

FACULTY OF LIFE SCIENCES

DEPARTMENT OF CROP SCIENCE

BACHELOR OF SCIENCE HONOURS DEGREE IN CROP SCIENCE

Module name: Biometry

Module code: LCS1102

First Semester Final Examination Paper

October 2020

This examination paper consists of 5 pages

Time Allowed:	**3 hours**
Total Marks:	**100**
Special Requirements:	Non-Programmable Calculator (provided by the student), Statistical Tables (provided by Department of Crop Science), Graph Papers (provided by Exams Board)
Examiner's Name:	**R. Mapuranga**

INSTRUCTIONS

1. Answer **all** questions from **Section A** and **two** questions from **Section B**.
2. Start each question on a new page
3. Each question carries 20 marks
4. At the end of the examination, attach all well numbered graph papers used in answering question inside the answer booklet.

SECTION A: ANSWER ALL QUESTIONS **[40 Marks]**

1. Define the following

   i. Population

   ii. Sampling frame

   iii. Discrete variable

   iv. Histogram **[4]**

   (b) Calculate the variance and standard deviation (SD) given the following: n = 40; $\sum x^2$ = 380 and $\sum x$ = 100 **[6]**

   (c) For the information in 1 (a) above, compute the CV (%) **[4]**

   (d) State the four scales of measurement and give one example for each scale **[4]**

   (e) The examination marks for college students is as given below. Calculate the **weighted mean** for this data if you are further given that the weighting for boys and girls is 40% and 60% respectively. [*Hint: first calculate the average for each group and use them to calculate the weighted mean*]. **[2]**

   Boys: 34; 78; 74; 53; 83; 85 and 48 **Girls:** 66; 73; 91; 88 and 82

2. The following data is cumulative leaf area (cm^2) for 30 soybean seedlings which was measured during an experiment.

23	14	17	24	10	22	9	13	17	18
45	9	39	16	12	14	26	28	12	21
13	8	17	43	33	21	22	26	37	33

   (a) Calculate the mean, mode and median for the data **[6]**

   (b) Calculate the lower quartile, upper quartile, and interquartile range **[6]**

   (c) Calculate the minimum, maximum and range **[3]**

   (d) Draw a stem and leaf plot for these data **[5]**

SECTION B: ANSWER ANY THREE (3) QUESTIONS **[60 Marks]**

3. (a) Using diagrams show the following

   i. Precision and accuracy both high **[1]**

   ii. High precision (as in (a)) and low accuracy **[1]**

   iii. Low precision and high accuracy (as high as in (a)) **[1]**

   iv. Both precision and accuracy being lower than in (a) **[1]**

   (b) The following weights are for Mr Gumbo's 10 porkers. They were weighed on 1 August 2020 and then re-weighed a month later.

Weight of porkers in August (kg), Sample A	Weight of porkers in September (kg), Sample B
12.1	11.8
12.3	14.1
10.2	12.3
10.0	13.0
11.0	12.5
11.5	10.9
10.7	12.4
12.1	12.6
13.2	13.7
12.0	12.6

   Carry out a paired t - test to find out if the porkers weighed the same in August and September **[16]**

4. (a) For a normal distribution, find the probability that a random variable lies within (i) one standard deviation of the mean, (ii) two standard deviation the mean **[4]**

   (b) What are the characteristics of a binomial random variable? **[3]**

   (c) A biologist collects leaf litter from quadrats placed randomly at night on the ground

in each of two woodlands. The first woodland has clay soils while the other woodland has sand soils. Two species of woodlice were found in the leaf litter collected from the quadrats and the numbers of each species are summarized in the following table. Using the Chi-Square test of Independence, test to see if the presence of woodlice species is independent of the soil type. **[13]**

	Oniscus	*Armadilidium*	Total
Clay soil	14	6	20
Sand soil	22	46	68
Total	36	52	88

5. The following are the average boll weights and yield per plot for 10 varieties of cotton obtained in a variety trial during an above normal rain season. Both the boll weight and plot yield were measured at the end of the season after harvesting.

Variety	Average boll weight (x) in grams	Yield per plot (y) in kilograms
CRI MS1	0.56	2.1
SZ9314	0.58	2.8
Variety W	0.62	3.1
FQ902	0.61	3.9
QM301	0.67	4.3
Varity X	0.63	3.7
Variety Y	0.63	4.4
Variety Z	0.68	5.1
CRI MS2	0.66	5.9
LS9219	0.67	6.5

(a) Plot the scatter plot of the plot yield (y axis) against the boll weight (x axis) **[4]**

(b) Calculate the regression line for the plot yield (y) against the boll weight (x) **[10]**

(c) Calculate the correlation coefficient for the plot yield against boll weight. Comment on the resulting correlation coefficient **[6]**

6. Sightings of a rare species of animal follow a Poisson distribution. Suppose the number of sightings per week (x) is recorded over a year. The mean sightings were recorded as 1.9.

(a) Calculate the probability of four sightings in one week **[3]**

(b) Calculate the probability of 3 or more sightings per week **[5]**

(c) Under what circumstances does a Poisson distribution approximate a binomial distribution? **[3]**

(d) Why is it useful in some circumstances to use approximations instead of actual distribution in statistics **[2]**

(e) A survey of 20 farmers is conducted to ascertain their willingness to participate in a trial of new cabbage variety. Suppose that 70% (unknown to us) are willing to participate in the trial. Find the mean and standard deviation of x, the number in favour of participating in the trial **[2]**

(f) Graph the probability distribution of x (from 7 (e) above) and locate interval $\mu-2\sigma$ and $\mu+2\sigma$ **[5]**

END OF EXAMINATION