THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

FIRST SEMESTER FINAL EXAMINATION –2021

DEPARTMENT OF AGRICULTURE – 3RD YEAR DEGREE

AG 312 – INTRODUCTION TO RESEARCH METHODOLOGY

TIME ALLOWED:- 3 HOURS. TOTAL MARKS = 100

INFORMATION FOR CANDIDATES:

1. You have 10 minutes to read the paper. You must not begin writing during this time

2. This paper has 3 sections (A,B and C), and 7 questions on 6 pages including this front page

3. Answer **all questions in sequential order (i.e. answer the questions in the order in which they appear, do not mix answers to questions from different sections)**

4. All answers must be written in the answer book. No other written material will be accepted

5. This is a closed book examination. Slide rules, calculators and log tables are permitted in the examination room. Notes, textbooks and other recording devices (e.g. mobile phones) are not allowed

6. Write your name and number clearly on the front page of the answer book. Do it now.

7. Marks for each question are shown in parenthesis at the end of each question or section.

Section A (Prof S Akanda) -Answer all questions. 25 marks

Question 1.(15 marks)

1. What is a research? (2)
2. Define Explanatory and Exploratory research (2 +2)
3. List down the important characteristics of research (3)
4. Name the important steps in a research process (4)

Question 2. .(10 marks)

a) Why literature review is important in conducting research? (5)
b) Explain the factors you would consider in selecting a suitable research problem. (5)

Section B (Dr V Bue) Answer all questions. 23 marks

Question 3. (16 marks)
Differentiate between these terms with appropriate examples

(a) Study concept and variable (4 marks)
(b) Probability and non-probability sampling (4 marks)
(c) Open and closed-ended question (4 marks)
(d) Ambiguous and double-barrelled questions (4 marks)

Question 4 .(7 marks)
If you were to study 'how drug dealers in Lae conduct their illicit activities, explain why non-probability sampling is the most appropriate method to use to select your sample (4 marks)

Section C (Prof G Danbaro) Answer all questions. 52 marksmarks

Question 5 (3 marks each, total = 12)

Explain and/or define any four of the following terms?

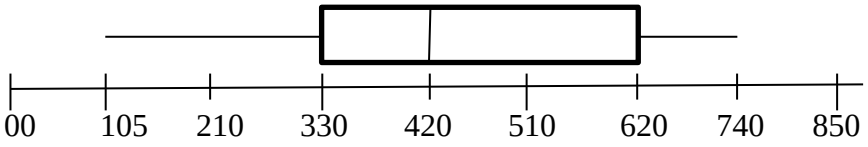
5.1. The mode of a set of measurements or values. (3)
5.2. Robust statistics (3)
5.3. Pie chart (3)
5.4. Intercept of a linear regression line (3)
5.5. Coefficient of determination or R^2 value of a linear regression fit. (3)

Question 6 (10 marks)
The following are 24 values of a variable obtained from an experiment:
43, 70, 52, 76, 84, 68, 42, 50, 72, 58, 60, 62, 50, 56, 60, 32, 40, 58, 90, 58, 44, 67, 73, 85

6.1. Construct a stem-and-leaf chart using all values (3)

6.2. Comment on the distribution of values in your stem and leaf chart (1)

The Figure below shows the boxplot of the live weights (g) of a bird species captured by an ornithologist. Answer the following questions (clearly show how you got your answers)



6.3. What is the approximate range of the values? (2)

6.4. What is the approximate inter-quartile range of the values? (2)

6.5. What is the median value? (2)

Question 7 (30 marks)

Suppose vegetable farmers in your village want to know which of three types of fertilizers (A, B & C) will increase yield of their crop most. Well, you do not know the correct answer so you start by proposing that, maybe, all three fertilizers will give the same yield if applied in equal amounts to the soil on which the vegetables are grown. Then you go ahead to test your proposition by preparing 12 plots measuring 2m by 3m each. Then you randomly assign each fertilizer to four plots and grow 10 stands of the vegetable on each plot. Soon after planting, you apply equal amounts of each fertilizer to their assigned plots. From the time of sowing to the time you harvested the vegetables you applied the same management practices (e.g. weeding, watering etc.) to all the plots. You then allow the vegetables to grow to maturity and then randomly selected and harvested 6 stands from each plot on the same day and weigh the produce from each plot. Analysis of variance (ANOVA) was carried out on the yield of vegetables using SPSS software. Parts of the result of ANOVA are shown in Tables 1-3 below. Use this information to answer the following questions 7.1 to 7.16 below. Clearly show how you got your answer. Correct all answers to at most, two decimal places

7.1. What was the null hypothesis being tested in this experiment? (1)
7.2. How many treatments were there in this experiment? (1)
7.3. What was the response or independent variable in this experiment? (1)
7.4. How many replicates were used for each treatment in this experiment? (1)
7.5. What was the experimental unit? (1)
7.6. What was the sampling unit in this experiment? (1)
7.7. Why were the fertilizers assigned randomly to the plots? (1)
7.8. What is the value of X1 in Table 1? (2)
7.9. What is the value of X2 in Table 1? (2)
7.10. What is the value of X3 in Table 1? (2)
7.11. What is the value of X4 in Table 1? (2)
7.12. What is the value of X5 in Table 1? (2)
7.13. Did the type of fertilizer significantly affect crop yield? Explain your answer. (2)

7.14. Carry out mean separation and show your result in the form of a Table. (4)

7.15. Which fertilizer(s) gave the highest mean yield? (1)
7.16. Which fertilizer(s) gave the lowest mean yield? (1)

Table 1. Incomplete results of analysis of variance of yield of vegetables					
Source of variation	Sum of Squares	df	Mean Square	F	Critical F, α=0.05
Between fertilizers	55.35				
Within fertilizers		**12**	0.624		
Total	62.84	15			

Table 2. Descriptive statistics of Yield.			
Fertilizer	**N**	**Mean**	**Std. Deviation**
A	4	10.90	1.19
B	4	8.8	0.54
C	4	6.83	0.71
D	4	6.15	0.53

Table 3. Multiple Comparisons of mean yields.				
Dependent Variable: Yield. LSD				
(I) Fertilizer	(J) Fertilizer	Mean Difference (I-J)	Std. Error	Sig.
A	B	2.02500*	.55846	.003
	C	4.07500*	.55846	.000
	D	4.75000*	.55846	.000
B	A	-2.02500*	.55846	.003
	C	2.05000*	.55846	.003
	D	2.72500*	.55846	.000
C	A	-4.07500*	.55846	.000
	B	-2.05000*	.55846	.003
	D	.67500	.55846	.250
D	A	-4.75000*	.55846	.000
	B	-2.72500*	.55846	.000
	C	-.67500	.55846	.250

F Values for α = 0.05

		d_1 Numerator degrees of freedom								
		1	2	3	4	5	6	7	8	9
d_2 denominator degrees of freedom	1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5
	2	18.51	19.00	19.16	19.25	19.3	19.33	19.35	19.37	19.38
	3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81
	4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00
	5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77
	6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10
	7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68
	8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39
	9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18
	10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02
	11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90
	12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80
	13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71
	14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65
	15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59
	16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54
	17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49
	18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46
	19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42
	20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39