THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

FIRST SEMESTER FINAL EXAMINATION –2021

DEPARTMENT OF AGRICULTURE – 4TH YEAR DEGREE

AG 401 – 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 8 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. 30 marks

Question 1.

1.1. Define research. (2)
1.2. Explain the major characteristics of research. (8)

Question 2.

2.1. What are the significances of literature review? (5)
2.2. Describe the importance of research ethics. (5)

Question 3.

3.1. Define a research problem. (2)
3.2. Explain the various guidelines for selecting a suitable research problem.

Section B (Dr V Bue) Answer all questions. 20 marks

Question 4

Differentiate between these terms with appropriate examples
4.1. Study concept and variable (4 marks)

4.2. Probability and non-probability sampling (4 marks)

4.3. Open and closed-ended question (4 marks)

4.4. Ambiguous and double-barrelled questions (4 marks)

Question 5

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. 50 marks

Question 6 (5 marks)

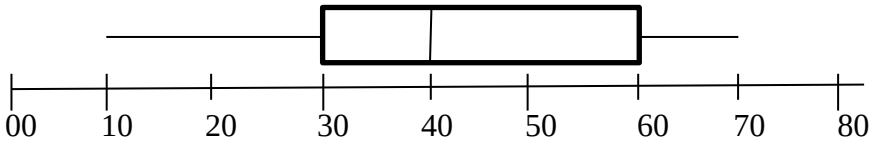
In the course of doing research a scientist collected the following data on a number of village people: sex, clan, blood group, age, level of income (low, medium, high). What type of measurement scale was used for each of these variables (ordinal, nominal or interval)? (5)

Question 7 (15 marks)

The following are 24 values of a variable obtained from an experiment:
43, 70, 52, 36, 84, 68, 42, 50, 72, 58, 60, 62, 50, 56, 60, 32, 40, 58, 90, 58, 44, 67, 73, 84
Use this information to answer question 7.1, and 7.2,
7.1. Construct a stem-and-leaf chart using all values (5)

7.2. 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 an insect species captured by an entomologist. Use this information to answer question 7.3, 7.4, and 7.5, (clearly show how you got your answers)



7.3. What is the approximate range of the values? (3)

7.4. What is the approximate inter-quartile range of the values? (3)

7.5. What is the median value? (3)

Question 8 (30 marks)

An entomologist wanted to know how the *location* of his moth traps on a tree and the *type of lure* used affected the number of moths he caught. He, therefore, designed a two-factor experiment and used a randomized complete block design. The experiment involved:

i. Factor 1: Location of trap in tree (top branches, middle branches, lower branches, ground)
ii. Factor 2: Type of lure in trap (scent, sugar, chemical)
iii. Response variable: *number of moths* found in trap after 48 hours

Analysis of variance was carried out to determine the effect of the two factors on the response variable and parts of the results are shown in Tables 1-4 below. Use this information to answer Questions 8.1 to 8.6 below.

8.1. How many treatments did this experiment involve? (4)

8.2. How many replicates were used in each treatment? (4)

8.3. Write down a statistical model for this experiment. Define any symbols used (4)

8.4. Write down the null hypotheses for this experiment (4)

8.5. Did the treatments have significant effects on the response variable? Explain. (4)

8.6. Draw a Table of means and their standard deviations for location and carry out mean separation (8). Comment on the results of mean separation (2)

Table 1. Descriptive Statistics				
Dependent Variable: Number of Moths				
Location	Type of Lure	Mean	Std. Deviation	N
Top	Scent	21.4000	8.26438	5
	Sugar	25.6000	7.92465	5
	Chemical	23.0000	7.07107	5
	Total	23.3333	7.41299	15
Middle	Scent	27.8000	12.55787	5
	Sugar	33.4000	8.82043	5
	Chemical	31.8000	8.89944	5
	Total	31.0000	9.79067	15
Lower	Scent	32.8000	8.75785	5
	Sugar	31.2000	9.44458	5
	Chemical	36.0000	4.00000	5
	Total	33.3333	7.49921	15
Ground	Scent	17.0000	4.30116	5
	Sugar	21.0000	6.51920	5
	Chemical	19.2000	4.43847	5
	Total	19.0667	5.09154	15
Total	Scent	24.7500	10.28988	20
	Sugar	27.8000	9.05887	20
	Chemical	27.5000	9.05829	20
	Total	26.6833	9.42678	60

Table 2. Analysis of Variance Table					
Dependent Variable: Number of Moths					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2209.383[a]	11	200.853	3.178	.003
Intercept	42720.017	1	42720.017	675.950	.000
Location	1981.383	3	660.461	10.450	.000
Type Of Lure	113.033	2	56.517	.894	.416
Location * Type of Lure	114.967	6	19.161	.303	.932
Error	3033.600	48	63.200		
Total	47963.000	60			
Corrected Total	5242.983	59			
a. R Squared = 0.421 (Adjusted R Squared = 0.289)					

Table 3. Pairwise Comparisons						
Dependent Variable: Number of Moths						
(I) Location	(J) Location	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
Top	Middle	-7.667*	2.903	.011	-13.503	-1.830
	Lower	-10.000*	2.903	.001	-15.837	-4.163
	Ground	4.267	2.903	.148	-1.570	10.103
Middle	Top	7.667*	2.903	.011	1.830	13.503
	Lower	-2.333	2.903	.425	-8.170	3.503
	Ground	11.933*	2.903	.000	6.097	17.770
Lower	Top	10.000*	2.903	.001	4.163	15.837
	Middle	2.333	2.903	.425	-3.503	8.170
	Ground	14.267*	2.903	.000	8.430	20.103
Ground	Top	-4.267	2.903	.148	-10.103	1.570
	Middle	-11.933*	2.903	.000	-17.770	-6.097
	Lower	-14.267*	2.903	.000	-20.103	-8.430
Based on estimated marginal means						
*. The mean difference is significant at the .05 level.						
b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).						

Table 4. Pairwise Comparisons					
Dependent Variable: Number of Moths					
(I) Type Of Lure	(J) Type Of Lure	Mean Difference (I-	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]

		J)			Lower Bound	Upper Bound
Scent	Sugar	-3.050	2.514	.231	-8.105	2.005
	Chemical	-2.750	2.514	.279	-7.805	2.305
Sugar	Scent	3.050	2.514	.231	-2.005	8.105
	Chemical	.300	2.514	.906	-4.755	5.355
Chemical	Scent	2.750	2.514	.279	-2.305	7.805
	Sugar	-.300	2.514	.906	-5.355	4.755
Based on estimated marginal means						
a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).						