



UNIVERSITY OF RUHUNA
FACULTY OF FISHERIES AND MARINE SCIENCES & TECHNOLOGY

Academic Year 2022/2023

Bachelor of Science Honors in Fisheries and Marine Sciences Degree

Level III Semester II Examinations – October/November 2024

FAQ 3252: Statistics for Aquatic Sciences

Time: 1 hour & 30 minutes

Answer **only three (03)** questions by selecting **at least one question** from each part.

Part I

01. a) Differentiate the following pairs

- i. sample and the population
- ii. discrete variables and continuous variables
- iii. ranking variables and derived variables
- iv. systematic errors and random/residual errors
- v. null hypothesis and alternative hypothesis

(40 marks)

b) "Probability sampling ensure representativeness by giving everyone in the target population an equal chance of being selected." Justify this statement.

(60 marks)

02. An undergraduate student at the Faculty of Fisheries and Marine Sciences & Technology wanted to check the effects of three different diets (**Diet A, B, and C**) on the growth performance and survival rate of Nile tilapia (*Oreochromis niloticus*). He is expected to conduct this research for **eight weeks** and growth performance will be evaluated in terms of final mean body weight and percentage specific growth rate (% SGR) of fish. **Twelve (12)** circular fiberglass tanks each with 100L capacity and 500 fish fingerlings (5.0g – 6.2g body weight) are available for his research.

a) Suggest a suitable **parametric test** to compare the effects of **three different feeds** on growth performance and survival rate of Nile tilapia. Give reasons for your suggestion.

- (10 marks)
- b) Write the null hypothesis and alternative hypothesis for the suggested experiment. (10 marks)
- c) Briefly explain the experimental setup. (10 marks)
- d) Suggest a method to allocate the tanks for each treatment. (10 marks)
- e) Summarize the measures that should be taken into consideration for minimizing errors. (20 marks)
- f) What are the additional measurements you would suggest collecting and why do you recommend those measurements? (10 marks)
- g) Categorize the type of descriptive statistics that you would suggest calculating for comparing two commercial feeds. (10 marks)
- h) If the percentage survival of fish at the end of the experiment is not normally distributed, what do you recommend doing next? Explain your answer. (20 marks)

03. Write short accounts on **any four (04)** of the following.

- a) Normal distribution
- b) Experimental units in aquaculture
- c) Measure of central location
- d) Measure of dispersion/variability
- e) Confidence interval (CI)

(100 marks)

Part II

04. a) Explain the concept of non-parametric tests. (10 marks)
- b) Mentioned the appropriate non-parametric test as an alternative to each parametric test mentioned in the table below. (12 marks)

Parametric test	Non-parametric test
t-test for independent samples	
Paired t-test	
One-way analysis of variance (one-way ANOVA)	
Two-way analysis of variance (two-way ANOVA)	

- c) Summarize the limitations and advantages of using non-parametric tests. (24 marks)
- d) Describe various methods for ranking data. (14 marks)
- e) A group of scientists tested the blood cholesterol concentration of male and female green turtles, and the statistical test results are provided below. Explain how to interpret the results, outlining suitable steps. (40 marks)

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Mean serum cholesterol concentration	13	224.9000	3.97827	218.60	230.80
group	13	1.3846	0.50637	1.00	2.00

Mann-Whitney Test

Ranks

	group	N	Mean Rank	Sum of Ranks
Mean serum cholesterol concentration	Mean Serum cholesterol concentration Male	8	6.13	49.00
	Mean Serum cholesterol concentration Female	5	8.40	42.00
	Total	13		

Test Statistics^a

	Mean serum cholesterol concentration
Mann-Whitney U	13.000
Wilcoxon W	49.000
Z	-1.025
Asymp. Sig. (2-tailed)	0.306
Exact Sig. [2*(1-tailed Sig.)]	0.354 ^b

- a. Grouping Variable: group
- b. Not corrected for ties.

05. a) State the main uses of correlation analysis. How does it differ from regression analysis? (15 marks)
- b) Mentioned the assumption for linear regression. (20 marks)
- c) Giving a suitable example, explain the importance of data transformation in regression. (20 marks)
- d) The following table gives information on the scale length (in mm) and mean standard length (mm) of 30 juvenile finfish.

Scale length (mm)	Standard length (mm)	
	Mean	SD
1	27.3	3.8
2	35.3	4.0
3	47.0	5.5
4	56.1	5.6
5	81.7	4.8
6	92.7	6.8
7	112.8	4.7
8	128.9	5.8
9	148.8	4.4

- i. State the null and alternative hypotheses for a regression analysis of the above data.
- ii. Identify the dependent and independent variables.
- iii. How do you describe the relationship between two parameters using the following information? (Intercept = 3.2659, Slope = 15.582, $R^2 = 0.9853$) (45 marks)

@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@