



UNIVERSITY OF RUHUNA  
FACULTY OF FISHERIES AND MARINE SCIENCES & TECHNOLOGY

Academic Year 2023/2024

Bachelor of Science Honors in Fisheries and Marine Sciences Degree

Level III Semester II Examinations – April/May 2025

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) Compare the following pairs
- primary data and secondary data
  - discrete variables and continuous variables
  - sample and population
  - finite population and infinite population
  - probability sampling and non-probability sampling
- (40 marks)
- b) “Probability sampling is crucial in fisheries and aquatic science research” Justify this statement. Provide relevant examples from fisheries and aquatic science research to support your explanation.
- (60 marks)
02. An undergraduate student of the Faculty of Fisheries and Marine Sciences & Technology decided to compare the effects of commercially available color enhancing diet on growth performance and carotenoid deposition of platy fish, *Xiphophorus maculatus*. The student purchased two commercial color enhancing diets having almost similar proximate compositions for this study. He planned to feed fish with those diets for eight weeks and determine growth performance, survival rate and carotenoid content of the fish body to compare two diets. Twelve (12) glass aquaria each with 40L capacity and 300 fish fry (0.05g – 0.06g body weight) are available for his research.

- a) Suggest a suitable **parametric test** to compare the effects of two diets on growth performance and carotenoid content of the fish. Give reasons for your suggestion. (10 marks)
- b) Write the null hypothesis and alternative hypothesis for the suggested experiment. (10 marks)
- c) Explain the experimental setup. (10 marks)
- d) Suggest a method to allocate the glass aquaria for each treatment. (10 marks)
- e) Summarize the measures that should be taken into consideration for minimizing errors. (20 marks)
- f) Recommend additional measures you would suggest collecting and explain the reasons for your suggestion. (10 marks)
- g) Categorize the type of descriptive statistics that you would suggest to compare 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 the following. (100 marks)
- a) Experimental units in aquaculture
  - b) Measure of central tendency and dispersion
  - c) Importance of precision and accuracy of data in statistical analysis
  - d) Variables

**Part II**

04. Non-parametric methods are often seen as a flexible alternative to parametric methods.

a) Discuss the advantages and disadvantages of using non-parametric tests in research (20 marks)

b) Describe what type of research scenario would each of the Mann-Whitney U test and the Kruskal-Wallis test be most appropriate for? (20 marks)

c) A group of scientists tested the clownfish egg hatching percentage using two methods, and the results of the analysis are provided below. Explain how to interpret the results, outlining appropriate steps. (60 marks)

**Mann-Whitney Test**

		Ranks		
	group	N	Sum of Rank	Calculated U-value
Egg hatching percentage	Method 1	7	70	7
	Method 2	7	35	42
	Total	14		

The critical value for the Mann-Whitney  $U$  at the point  $n_1 = 7$  and  $n_2 = 7$  at  $\alpha = 0.05$  is 8

05. a) Outline the primary applications of correlation analysis. In what ways does it differ from regression analysis? (15 marks)

b) List the assumptions for linear regression. (20 marks)

c) The following tables provide information on the two series of nitrate concentration ( $\mu\text{M}$ ) and its absorption in the spectrometer, which are used for preparing the calibration curves.

Table 1	
concentration of nitrate ( $\mu\text{M}$ )	Absorption
0	0
5	0.056

Table 2	
concentration of nitrate ( $\mu\text{M}$ )	Absorption
0	0
5	0.09

10	0.116
20	0.225
50	0.582

10	0.177
20	0.36
50	0.857

- 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?

	Table 1	Table 2
<b>Intercept</b>	0.0004	0.0003
<b>Slope</b>	0.0116	0.0173
<b>R<sup>2</sup></b>	0.9999	0.9997

(65 marks)

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