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Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2021/2022**

COURSE NAME : ADVANCED STATISTICS FOR
BIODIVERSITY CONSERVATION
COURSE CODE : CWJ 10402
PROGRAMME : CWJ
EXAMINATION DATE : JANUARY 2022/FEBUARY 2022
DURATION : 3 HOURS
INSTRUCTION : 1. ANSWER **ALL** QUESTIONS
2. THIS FINAL EXAMINATION IS
AN **ONLINE** ASSESMENT AND
CONDUCTED VIA **CLOSED**
BOOK

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

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Q1 Given the following data in **Table Q1**

- (a) Calculate and fit the multiple linear regression model for the data given. (10 marks)
- (b) Test the hypothesis that there is no significant multiple regression relationship (7 marks)
- (c) Calculate the standard error of each partial regression coefficient and test each $H_0 : \beta_i = 0$ (6 marks)
- (d) Determine the predicted mean population value of Y at $X_1 = 5.2\text{cm}$, $X_2 = 21.3\text{cm}$, $X_3 = 19.7\text{cm}$, and $X_4 = 12.2\text{cm}$ (2 marks)

Q2 Suppose we have 4 different diets which we want to compare. The diets are labeled Diet A, Diet B, Diet C, and Diet D. We are interested in how the diets affect the coagulation rates of rabbits. The coagulation rate is the time in seconds that it takes for a cut to stop bleeding. We have 16 rabbits available for the experiment, so we will use 4 on each diet. Structuring how should we use randomization to assign the rabbits to the four treatment groups? The 16 rabbits arrive and were placed in a large compound until you are ready to begin the experiment, at which time they will be transfer to cages.

- (a) Assume that rabbits will be caught "at random". Catch four rabbits and assign them to Diet A. Catch the next four rabbits and assign them to Diet B. Continue with Diets C and D. Since the rabbits were "caught at random", this would produce a completely randomized design. (7 marks)
- (b) Catch all the rabbits and label them 1-16. Select four numbers 1-16 at random (without replacement) and put them in a cage to receive Diet A. Then select another four numbers at random and put them in a cage to receive Diet B. Continue until you have four cages contained with four rabbits each. (6 marks)
- (c) Have a bowl with the letters A, B, C, and D printed on separate slips of paper. Catch the first rabbit, pick a slip at random from the bowl and assign the rabbit to the diet letter on the slip. Do not replace the slip. Catch the second rabbit and select another slip from the remaining three slips. Assign that diet to the second rabbit. Continue until the first four rabbits are assigned one of the four diets. In this way, all of the slow rabbits have different diets. Replace the slips and repeat the procedure until all 16 rabbits are assigned to a diet. (6 marks)

- (d) Catch all the rabbits and label them 1-16. Put 16 slips of paper in a bowl, four each with the letters A, B, C, and D. Put another 16 slips of paper numbered 1-16 in a second bowl. Pick a slip from each bowl. The rabbit with the selected number is given the selected diet. To make it easy to remember which rabbit gets which diet, the cages are arranged as shown below. (6 marks)
- Q3** Sampling is a fundamental part of statistics. Samples are collected to achieve an understanding of a population because it is typically not feasible to observe all members of the population. The goal is to collect samples that provide an accurate representation of the population. Constraints on time and money dictate that the sampling effort must be efficient. More samples are needed to characterize the nature of highly variable populations than less variable populations.
- (a) Differentiate and explain **FOUR (4)** criteria between census and sampling. (8 marks)
- (b) Define a census survey by giving an appropriate examples. (6 marks)
- (c) Explain **THREE (3)** the characteristics of good sample design. (6 marks)
- (d) Describe **TWO (2)** types of sample design in the research method by giving **ONE (1)** example. (5 marks)
- Q4** (a) Determine **THREE (3)** main criteria to differentiate between population density and population frequency. (6 marks)
- (b) Describe **FOUR (4)** factors in population change. (8 marks)
- (c) If 80 deers are captured, tagged, and released into the forest, and later 100 deer are captured with 20 of them are already marked. Estimate the population size using an appropriate equation. (7 marks)
- (d) Comment the results you obtained in Q4(c) for *autecology* and *cover*. (4 marks)

- END OF QUESTIONS -

FINAL EXAMINATION

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Table Q1: Length of butterflies wing towards the weight of their body

Y(g)	X1	X2	X3	X4
51.4	0.2	17.8	24.6	18.9
72	1.9	29.4	20.7	8
53.2	0.2	17	18.5	22.6
83.2	10.7	30.2	10.6	7.1
57.4	6.8	15.3	8.9	27.3
66.5	10.6	17.6	11.1	20.8
98.3	9.6	35.6	10.6	5.6
74.8	6.3	28.2	8.8	13.1
92.2	10.8	34.7	11.9	5.9
97.9	9.6	35.8	10.8	5.5
88.1	10.5	29.6	11.7	7.8
94.8	20.5	26.3	6.7	10
62.8	0.4	22.3	26.5	14.3
81.6	2.3	37.9	20	0.5