**ST JOSEPH’S UNIVERSITY, BENGALURU - 27**

Registration Number:

Date & Session:

**M.Sc. ENVIRONMENTAL SCIENCE AND SUSTAINABILITY – III SEMESTER**

**SEMESTER EXAMINATION: OCTOBER 2023**

**(Examination conducted in November/December 2023)**

**ES 9523: RESEARCH METHODOLOGY AND ENVIRONMENTAL STATISTICS**

 **(For current batch students only)**

**Time: 2 Hours Max Marks: 50**

**This paper contains 2 printed pages and 3 parts**

***Instruction: Draw diagrams wherever necessary***

**PART – A**

**Answer any FIVE of the following 2m x 5q = 10m**

1. Define degrees of freedom.
2. Differentiate between Null hypotheses from alternative hypotheses.
3. What are type I and type II errors?
4. Calculate the mean for the data set - 15, 20, 19, 24, 16, 20, 21, 22, 24,19.
5. Differentiate between stratified and systematic random sampling.
6. Define extraneous variables.
7. What is a monograph?

**PART – B**

**Answer any FOUR of the following 5m x 4q = 20m**

1. Calculate the standard deviation for the given data set -

14, 12, 13, 10, 11, 13, 14, 12, 12, 11, 10, 13, 12, 11, 10, 14.

1. Write a note on Kruskal-Wallis test.
2. Comment on quota sampling and snow-ball sampling with examples.
3. A random sample of size 15 has 50 as its arithmetic mean. The sum of the squares of the deviation taken from mean is 130. Can this sample be regarded as taken from the population having 53 as mean at 5% level of significance? **t(0.05, 14)** at 14 degree of freedom is 2.145.
4. Explain the purpose of the modulus operator (%%) in R.

list1<- c(2, 22)

list2<-c(2,4)

print(list-1 %% list-2)

What will be the output of the given programme?

1. Describe the steps involved in the formulation of a research plan.

**PART – C**

**Answer ALL of the following 10m x 2q = 20m**

1. a. A complete distribution is given below (**5 marks)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 |
| **Frequency** | 10 | 20 | ? | 40 | ? | 25 | 15 |

Given, median value is 35. Find out missing frequency. (Given, the total frequency = 170).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Number of seeds** | 12 | 9 | 8 | 10 | 11 | 13 | 7 |
| **Weight of the seeds** | 14 | 8 | 6 | 9 | 11 | 12 | 3 |

 b. Calculate Karl Pearson’s correlation for the given data set (**5 marks)**

**OR**

The performance of three sets of students was carried out and presented. Carry out the analysis of variance using ANOVA test. Given that tabulated F value is f(2,12) = 3.89.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **A** | 9 | 11 | 13 | 9 | 8 |
| **B** | 13 | 12 | 10 | 15 | 3 |
| **C** | 14 | 13 | 17 | 7 | 9 |

1. Describe the various data collection methods. Add a note on data analysis. **(6 + 4)**

**OR**

Discuss the principles of experimental design. Add a note on Randomized Block Design. **(6 + 4)**