

SCHOOL OF ADVANCED SCIENCES
DEPARTMENT OF MATHEMATICS
WINTER SEMESTER - 2024-25
PMDS503P – Statistical Inference
LAB – Programming with R

LAB ASSIGNMENT

Date: 24.03.2025

1. The last date for submission of the E-record for the assignment is **03rd April 2025**.
2. Mention the Register Number, Name, Slot details, course code and Course Title on the first page of the document.

Assignment No. 5

1. The diameter of a ball bearing was measured by 12 inspectors, each using two different kinds of calipers. The results were as follows:

Inspector	Caliper -1	Caliper-2
1	0.265	0.264
2	0.265	0.265
3	0.266	0.264
4	0.267	0.266
5	0.267	0.267
6	0.265	0.268
7	0.267	0.264
8	0.267	0.265
9	0.265	0.265
10	0.268	0.267
11	0.268	0.268
12	0.265	0.269

Is there significant difference between the medians of the population of measurements represented by the two samples? Use $\alpha = 0.05$.

2. The titanium content in an aircraft-grade alloy is an important determinant of strength. A sample of 20 test coupons reveals the following titanium content (in percent):

8.32, 8.05, 8.93, 8.65, 8.25, 8.46, 8.52, 8.35, 8.36, 8.41, 8.42, 8.30, 8.71, 8.75, 8.60, 8.83, 8.50, 8.38, 8.29, 8.46.

Suppose that the distribution of titanium content is symmetric and continuous.

Wilcoxon signed-rank test $\alpha = 0.05$ to test the hypothesis $H_0: \mu = 8.5$ versus $H_1: \mu \neq 8.5$.

3. An electrical engineer must design a circuit to deliver the maximum amount of current to a display tube to achieve sufficient image brightness. Within her allowable design constraints, she has developed two candidate circuits and tests prototypes of each. The resulting data (in microamperes) are as follows:

Circuit 1: 251, 255, 258, 257, 250, 251, 254, 250, 248

Circuit 2: 250, 253, 249, 256, 259, 252, 260, 251

Use the Wilcoxon rank-sum test to test $H_0: \mu_1 = \mu_2$ versus $H_0: \mu_1 > \mu_2$. Use $\alpha = 0.10$.

4. A machine working correctly cuts pieces of wire to a mean length of 10.5 cm with a standard deviation of 0.15 cm. Sixteen samples of wire were drawn at random from a production batch and measured with the following results (centimeters):

10.4 10.6 10.1 10.3 10.2 10.9 10.5 10.8 10.6 10.5 10.7 10.2 10.7 10.3 10.4 10.5

Test the hypothesis that the machine is working correctly, i.e. the data fits to the normal distribution $N(\mu = 10.5, \sigma^2 = 0.15^2)$ at $\alpha = 0.05$ by using Kolmogorov-Smirnov goodness-of-fit test.