SCHOOL OF ADVANCED SCIENCES

DEPARTMENT OF MATHEMATICS

WINTER SEMESTER - 2024-25

PMDS503P – Statistical Inference LAB

LAB – Programming with R

LAB ASSIGNMENT Date: 27.02.2025

1. The last date for submission of the E-record for Assignment is 27th **February 2025.**
2. Mention the Register Number, Name, Slot details, Course Code and Course Title on the document's first page.

Assignment No. 2

1. Medical researchers have developed a new artificial heart constructed primarily of titanium and plastic. The heart will last and operate almost indefinitely once it is implanted in the patient's body, but the battery pack needs to be recharged about every four hours. A random sample of 50 battery packs is selected and subjected to a life test. The average life of these batteries is 4.05 hours. Assume that battery life is normally distributed with standard deviation is 0.2 hour. Is there evidence to support the claim that mean battery life exceeds 4 hours? Use $\boldsymbol{\alpha = 0.01}$ & $\mathbf{0.05}$..

2. Two different formulations of an oxygenated motor fuel are being tested to study their road octane numbers. The variance of road octane number for formulation-1 is 1.5, and for formulation-2 it is 1.2 Two random samples of size $n_1 = 35$ and $n_2 = 40$ are tested, and the mean road octane numbers observed are 89.6 and 92.5. Assume normality,

   (a) Construct a 95% two-sided confidence interval on the difference in mean road octane number.

   (b) If formulation 2 produces a higher road octane number than formulation 1, the manufacturer would like to detect it. Formulate and test an appropriate hypothesis, using $\boldsymbol{\alpha = 0.10}$ & $\mathbf{0.05}$.

3. A random sample of 500 registered voters in Bangalore is asked if they favor the use of oxygenated fuels year-round to reduce air pollution. If more than 400 voters respond positively, we will conclude that at least 60% of the voters favor the use of these fuels. Find the probability of type I error if exactly 60% of the voters favor the use of these fuels.

4. A random sample of 500 adult residents of Maricopa County found that 385 were in favor of increasing the highway speed limit to 75 mph, while another sample of 400 adult residents of Pima County found that 267 were in favor of the increased speed limit. Do these data indicate that there is a difference in the support for increasing the speed limit between the residents of the two counties? Use $\boldsymbol{\alpha = 0.05}$. What is the *P*-value for this test?