Hindi Vidya Prachar Samiti's
Ramniranjan Jhunjhunwala College of Arts, Science and Commerce(Autonomous)

Program : MSc Statistics-II **Sem : IV**

Practical-4 Natural & Modified Control Limits

Q.1. An airplane manufacturer produces aluminum wings with a **design length of 15m**, following a **normal distribution** with **mean = 15.02m** and **SD = 0.06m**. Due to safety regulations, the wings must be within ±3 standard deviations of the process mean.

a) **Compute natural tolerance limits (±3σ around the mean).**
b) **Check if the specification range (14.85m to 15.15m) covers all wings within safe limits.**

Q.2. A **pharmaceutical company** monitors the **dissolution time** (in minutes) of a new tablet formulation. They collect **25 samples** of **4 tablets each**, recording their **average dissolution time** and **range**. Historical data suggests a **mean dissolution time of 30 minutes**, a **standard deviation of 1.5 minutes**, and a **sample range between 2 to 6 minutes**. The **A2 constant for n = 4 is 0.729**. To reduce false alarms, the company **modifies the control limits by widening them by 15%**. **Calculate and compare** traditional vs. modified control limits, **plot an $\bar{X}$ control chart**, and **identify out-of-control points** based on the modified limits.

Q.3. A **food packaging company** produces snack packets with a target weight of **200g**. A recent quality check measured the weights (in grams) of **12 packets**:
198, 202, 199, 201, 203, 197, 200, 204, 196, 205, 198, 202
The company applies **modified control limits**, widening the traditional **$\bar{X}$ chart limits** by **10%** to reduce false rejections.
Tasks:

a) **Calculate the traditional and modified control limits.**
b) **Plot an $\bar{X}$ control chart and identify out-of-control points.**