**ASSIGNMENT NO.2**

**Estimation And Confidence Intervals**

**Task (a): Build a 99% Confidence Interval Using Sample Standard Deviation**

* **Calculate the Sample Mean (**) **and Sample Standard Deviation (s):**

We have given,

1.13,1.55,1.43,0.92,1.25,1.36,1.32,0.85,1.07,1.48,1.20,1.33,1.18,1.22,1.29

**Sample Mean () :**

= 1.2387

Sample Standard Deviation (s):

First, compute the squared differences from the mean, then sum them:

≈0.4128

Then, calculate the sample variance:

= ≈ 0.0295

Finally, compute the standard deviation:

**S = 0.0295 ​≈ 0.1718**

**Determine the t-value:** For a 99% confidence interval and 14 degrees of freedom, the critical t-value (t∗) from the t-distribution table is approximately 2.977.

D.F = n-1 = 14

t\* = 2.977.

Standard Error = 0.04435

So, the confidence interval is:

Upper confidence interval =1.2387+2.977\*0.04435= **1.3706**

Lower confidence interval =1.2387-2.977\*0.04435= **1.1068**

**99% Confidence Interval using sample standard deviation:** (1.1068, 1.3706)

**Task (b): Build a 99% Confidence Interval Using Known Population Standard Deviation**

Given Information,

Population Standard Deviation (σ) = 0.2 million characters.

Sample Mean (xˉ) = 1.2387 (calculated previously).

Sample Size (n) = 15.

**Determine the z-score for a 99% Confidence Interval:**

For a 99% confidence level, the critical z-value (z∗) is approximately 2.576.

D.F = n-1 = 14

z\* = 2.576.

Standard Error = 0.0516

So, the confidence interval is:

Upper confidence interval =1.2387+2.576\*0.0516 = **1.3719**

Lower confidence interval =1.2387-2.576\*0.0516= **1.1055**

**99% Confidence Interval using known population standard deviation:** (1.1055, 1.3719)

**Interpretation**:

Both confidence intervals are quite similar, but using the population standard deviation yields a slightly narrower range, which is expected because the standard deviation is known and does not need to be estimated from the sample.