Assignment -3

Q). If $\mu = 55$, $\sigma_{4a} = 4$, $\sigma_{4\beta} = 10$, $\sigma_4 = c$ 15, In this which is better.

➢ Statistical measures are widely used to compare different datasets or alternatives in decision-making situations.

➢ multiple alternatives have the same average value, variability becomes the key factor in determining which option performs better.

➢ Measures such as standard deviation and coefficient of variation help evaluate consistency and reliability.

➢ In this assignment, three alternatives are compared using their mean and standard deviations.

➢ The objective is to identify the best alternative based on statistical stability and consistency.

➢ The analysis demonstrates how dispersion measures influence decision-making even when averages are identical.

1. Introduction:

➢ Statistics plays an important role in analyzing data and drawing meaningful conclusions.

➢ In many real-world situations such as business performance, manufacturing quality control, investment decisions, and academic assessment, comparing different alternatives is necessary.

➢ Often, alternatives may have the same mean (average) value, making it difficult to determine which one is better using the mean alone.

➢ In such cases, dispersion measures are used to evaluate how spread out the data values are around the mean.

Two important statistical tools used for comparison are:

a).Standard Deviation

b).Coefficient of Variation

A lower variation indicates higher consistency and predictability, which is usually preferred in practical applications.

2. Objectives of the Study:

The main objectives of this assignment are:

- ➢ To understand the concept of standard deviation.
- ➢ To compare alternatives having the same mean.
- ➢ To calculate the coefficient of variation.
- ➢ To determine the most consistent alternative.
- ➢ To interpret statistical results logically.

3. Given Data:

The following information is provided:

Mean value:

Standard deviations of three alternatives:

Alternative A: $\sigma A = 4$

Alternative B: $\sigma B = 10$

Alternative C: $\sigma C = 15$

The task is to determine which alternative is better.

4. Theoretical Background:

4.1 Mean:$\mu\mu$The mean represents the average value of a dataset and is calculated as:

$\mu = \Sigma x / n$

It provides a central value around which observations are distributed.

4.2 Standard Deviation:

Standard deviation measures how much the data values deviate from the mean. It indicates the spread or variability of data.

- ➢ Small standard deviation → Data values are close to the mean.
- ➢ Large standard deviation → Data values are widely spread.

Mathematically:

$\sigma = \sqrt{\Sigma(x-\mu)^2/n}$

In comparisons, lower standard deviation implies higher consistency.

4.3 Coefficient of Variation (CV):The coefficient of variation allows comparison between datasets relative to their mean values.

$CV = \sigma/\mu * 100$

It expresses variability as a percentage.

Interpretation:

- Lower CV → More stable and reliable.
- Higher CV → Less consistent.

5. Methodology:

To determine the best alternative:

a).Use the provided mean and standard deviation.

b).Calculate the coefficient of variation for each alternative.

c).Compare CV values.

d).Select the alternative with the lowest variability.

6. Calculations:

6.1 Alternative A:

CVA=4/55*100

CVA=7.27%

6.2 Alternative B:

CVB=10/55*100

CVB=18.18%

6.3 Alternative C:

CVC=15/55*100

CVB=27.27%

7. Results:

Alternative	Mean(μ)	Standard deviation (σ)
A	55	4
B	55	10
C	55	15

8. Discussion:

- ➢ Since all three alternatives have the same mean value, the average performance is identical. Therefore, the decision cannot be made based solely on the mean.
- ➢ The comparison must rely on variability:
- • Alternative A has the smallest standard deviation.
- • Alternative B shows moderate variability.
- • Alternative C has the highest dispersion.
- ➢ Lower variability indicates that the values remain closer to the mean, meaning performance is more predictable and stable.

➤ In practical terms:

- A company prefers consistent production output.

- Investors prefer stable returns.

- Educational assessment prefers consistent performance.

- Thus, consistency becomes the deciding factor.

9. Interpretation:

From the coefficient of variation:

➤ Alternative A → Most consistent
➤ Alternative B → Moderately consistent
➤ Alternative C → Least consistent

As variability increases, reliability decreases. Therefore, Alternative A demonstrates the best statistical performance among the three options.

10. Conclusion:

➤ This assignment analyzed three alternatives with the same mean using standard deviation and coefficient of variation. The calculations showed that Alternative A has the lowest dispersion and the smallest coefficient of variation.Hence,

➤ Alternative A is the best option because it provides maximum consistency and minimum variability.

➤ This study highlights the importance of dispersion measures in statistical decision-making and proves that mean alone is not sufficient for comparison.