



Seat No. : \_\_\_\_\_

# NJ-109

November-2025

B.B.A., Sem.-V

## DSC-M-355 : Industrial Statistics

Time : 2:00 Hours]

[Max. Marks : 50

- Instructions :**
- (1) Use of simple calculator is allowed.
  - (2) The graph will be provided on request.
  - (3) Values from statistical tables are provided for reference at the end of the question.

1. (A) Define : 5
  - (1) Null Hypothesis
  - (2) Alternative Hypothesis
  - (3) Type-I Error
  - (4) Type-II Error
  - (5) Level of Significance
1. (B) Ms. Dhvani, a researcher from Insight Research Labs, sampled 64 observations and found a sample mean of 12 with a variance of 4. Can she conclude that the population mean is 14 ? 5

**OR**

1. (A) Ms. Dipti, a researcher at BrightTech Labs, tested 180 electric bulbs from Company X and found that their average life was 1500 hours with a standard deviation of 100 hours. She also tested 220 electric bulbs from Company Y and found an average life of 1350 hours with a standard deviation of 90 hours. Can she conclude that the difference between the average lifespans of bulbs produced by both companies is statistically significant ? 5
1. (B) Dr. Rutvik, a researcher from Urban Health Institute, surveyed 800 men in a large city and found that 480 of them were smokers. Does this evidence support the hypothesis that the majority of men in the city are smokers ? 5

2. (A) Ms. Pankti, a researcher at Bright Education Labs, wanted to compare the average test scores of students from three different teaching methods. She collected the following scores :

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<b>Method A</b>	85	88	90
<b>Method B</b>	78	82	80
<b>Method C</b>	92	94	96

Can she conclude that there is a significant difference in the average test scores among the three teaching methods ?

$$[F_{(2, 6)} = 5.14]$$

2. (B) Ms. Anjali, a researcher at BrightFit Labs, wants to determine if a new fitness program affects the average number of push-ups adults can do in a minute. The known average for adults is 20 push-ups per minute. She tested a sample of 12 participants and found an average of 23 push-ups with a sample standard deviation of 4. Can she conclude that the fitness program significantly changes the average number of push-ups ?

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$$[t_{(11, 0.05)} = 2.201]$$

**OR**

2. (A) Ms. Shaily, a researcher at StatLab Analytics, collected two independent samples to compare the consistency of two machines. For Machine A, a sample of 6 observations had a variance of 5.2, while for Machine B, a sample of 12 observations had a variance of 3.8. Can she conclude that the population variances of the two machines are equal ?

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$$[F_{(5, 11)} = 3.20, F_{(11, 5)} = 4.70]$$

2. (B) Dr. Neha, a nutritionist at Healthy Life Clinic, administered a new dietary supplement to 10 patients and recorded the change in their daily energy levels (in points) as : 3, 5, 4, 6, 2, 1, 3, 4, 5, 2. Can it be concluded that the observed increase in energy levels is due to the supplement ?

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$$[t_{(9, 0.05)} = 2.262]$$

3. (A) Write 5 differences each of Variable Chart and Attribute Chart.

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3. (B) Mr. Prasheel, a quality analyst at TechGear Ltd., monitors the weight of packaged snacks. She collected 8 subgroups, each with 4 measurements. The calculated  $\bar{X}$  and R values are :

$\bar{X}$	50.2	50.1	50.3	50	51.2	50.2	50.1	50.3
<b>R</b>	0.4	0.5	0.3	0.4	0.6	0.5	0.4	0.3

Based on the  $\bar{X}$  analysis only, determine whether the process is under control or out of control.

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$$[\text{for } n = 4, A_2 = 0.729]$$

**OR**

3. (A) Mr. Kunjan, a quality engineer at BrightPack Ltd., monitors the number of defective packets in a daily production batch of 100 packets each. Over 10 days, the number of defective packets in each batch was recorded as : **5**

Number of defective packets (np) for Days 1-10: 5, 7, 6, 8, 12, 5, 6, 7, 6, 5

Construct an np chart and determine if the process is under control or out of control.

3. (B) Ms. Srushti, a quality engineer at CleanPack Ltd., monitors the number of scratches on glass bottles produced in a daily batch. Each day, she inspects 50 bottles. The number of scratches found over 12 days is recorded as follows : **5**

Number of scratches per day (C) : 3, 4, 2, 5, 3, 6, 4, 3, 2, 7, 3, 4

Construct a C-chart and determine whether the process is under control or out of control.

4. (A) Define : **5**

- (1) Acceptance Sampling
- (2) Acceptable Quality Level
- (3) Lot Tolerance Proportion Defective
- (4) Producer's Risk
- (5) Consumer's Risk

4. (B) For a Single Sampling Plan (1000, 100, 3), if  $p' = 0.01$ , then find probability of acceptance. **5**

$$(e^{-1} = 0.3678)$$

**OR**

4. (A) For a Single Sampling Plan (1000, 150, 1), if AQL = 0.01; Find Producer's Risk. **5**

$$[e^{-1.5} = 0.2231]$$

4. (B) For a Single Sampling Plan, if for fraction defective 0.02 value of ASN = 100, AOQ = 0.002708, ATI = 878, find the value of N. **5**

5. State whether each of the following statements is True or False : (Any **10**) (write in sequence) **10**

- (1) The main objective of taking a sample is to make inferences about the population.
- (2) A parameter is a numerical characteristic of a population.

- (3) 99% Confidence Interval for  $\mu$  is  $\bar{x} \pm 3 \frac{\sigma}{\sqrt{n}}$ .
  - (4) Independent sample t-test compares means of two unrelated groups, while dependent sample t-test compares means of related groups.
  - (5) Degrees of freedom is the number of independent observations of the variable.
  - (6) Analysis of Variance (ANOVA) technique is given by Ronald Fisher.
  - (7) p-chart is a chart of fraction defectives.
  - (8) Binomial distribution is used in p and np charts, while Hypergeometric distribution is used in C-chart.
  - (9) If the characteristics of items can be measured, attribute control charts are used.
  - (10) If producer's risk is 0.15, then probability of acceptance is 0.85.
  - (11) Power of a test = 1 – probability of Type II error ( $\beta$ ).
  - (12) (100, 20, 1) represents a sampling plan with sample size 100, acceptance number 20, and lot size 1.
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