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**BRAINWARE UNIVERSITY**

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Term End Examination 2025-2026**Programme – M.Sc.(AG)-Agronomy-2025****Course Name – Statistical Methods for Applied Sciences****Course Code - STAT502(T)****(Semester II)****Full Marks : 40****Time : 2:0 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 10=10

1. *Choose the correct alternative from the following :*

- (i) Select the meaning of arithmetic mean in agricultural data summaries.
- | | |
|--|--|
| a) Average value obtained by dividing total observations by their number | b) Middle value of arranged data |
| c) Most frequent value | d) Difference between highest and lowest value |
- (ii) Select the role of standard deviation in agricultural experiments.
- | | |
|---|------------------------|
| a) Indicating sample size | b) Identifying median |
| c) Expressing variability in original units | d) Measuring frequency |
- (iii) Choose the interpretation of the mean of a binomial distribution.
- | | |
|------------------------------------|---|
| a) Average of observed values only | b) Expected number of successes in fixed trials |
| c) Middle observation | d) Measure of spread |
- (iv) Choose the basic condition defining a Poisson distribution.
- | | |
|-------------------------------|---|
| a) Fixed number of trials | b) Events occur independently over a fixed interval |
| c) Two possible outcomes only | d) Equal probabilities of outcomes |
- (v) Choose the property of an estimator having minimum variance among unbiased estimators.
- | | |
|----------------|---------------|
| a) Sufficiency | b) Efficiency |
| c) Consistency | d) Linearity |
- (vi) Choose the meaning of least squares principle.
- | | |
|------------------------------------|---|
| a) Minimization of absolute errors | b) Minimization of sum of squared residuals |
| c) Maximization of correlation | d) Equal distribution of errors |
- (vii) Select the null hypothesis form in sign test for paired data.
- | | |
|----------------------------------|-----------------------------|
| a) Means are equal | b) Variances are equal |
| c) Median difference equals zero | d) Distributions are normal |
- (viii) Select the limitation of sign test.

- a) Difficult to compute
- b) Requires normality
- c) Ignores magnitude of differences
- d) Requires large samples
- (ix) Choose the assumption checked using data transformation.
 - a) Independence
 - b) Randomness
 - c) Homogeneity of variance
 - d) Sample adequacy
- (x) Choose the overall benefit of combining analysis of variance and sampling techniques.
 - a) Data reduction
 - b) Simplified models
 - c) Reliable inference about populations
 - d) Elimination of variability

Group-B

(Short Answer Type Questions)

2.5 x
6=15

2. Milk yield from cows fed on two different feed types was analysed using the Mann–Whitney U test. Feed A: $n_1=5, R_1=18$, Feed B: $n_2=6, R_2=48$. Estimate the test statistic. (2.5)
3. Enumerate the mean from the following frequency distribution of daily milk yield in litres: (2.5)

Milk yield (litres)	Frequency
6–8	5
8–10	9
10–12	11
12–14	5

4. A researcher studies the effect of 4 irrigation methods on wheat yield. The summary statistics are: Total Sum of Squares (TSS) = 200, Sum of Squares for Treatments (SST) = 120, Number of observations $n=20$ (5 per group), Number of groups $k=4$. Apply one-way ANOVA to test whether the mean yields differ among the three fertilizers. Critical value is 3.24. (2.5)
5. On an average, 2 defects occur per 100 fruits. Calculate the probability that a randomly selected fruit has no defect using the Poisson distribution. (2.5)

6. Given the following summary statistics: (2.5)

$$\bar{X} = 90, \bar{Y} = 35, S_{XY} = 420, S_{XX} = 600$$

where X = nitrogen applied (kg/ha) and Y = maize yield (q/ha). Estimate the regression equation of Y on X . The notations have their usual meanings.

7. The mean grain weight of rice from a sample of 12 plants is 24 g with a sample standard deviation of 3 g. Construct a 95% confidence interval for the population mean grain weight. The value of t is 2.201. (2.5)

OR

The mean daily water requirement of a crop estimated from 36 observations is 5.4 mm, with a known standard deviation of 0.6 mm. Construct a 95% confidence interval for the mean water requirement. The value of z is 1.96. (2.5)

Group-C

(Long Answer Type Questions)

5 x 3=15

8. The number of insects per plant observed for six pest samples is given below: 12, 15, 18, 35, 40, 42. Using k-means clustering with $k = 2$ and the initial centroids as 15 and 40, assign observations to clusters based on absolute distance and calculate the updated centroids. (5)
9. The following data relate to fertilizer applied (X) and crop yield (Y). (X,Y): (2,3), (4,5), (6,7), (8,9), (10,11). Evaluate Karl Pearson's coefficient of correlation. (5)
10. The average rice yield in a region is claimed to be 50 quintals per hectare. A sample of 36 farms shows a mean yield of 48 quintals per hectare. The population standard deviation is 6 quintals. Test the claim at 5% level of significance. The critical value is 1.96. (5)

OR

A dairy farm claims that the average milk yield per cow per day is 12 litres. A sample of 12 cows shows a mean yield of 11 litres with a standard deviation of 1.5 litres. Test the claim at 5% level of significance. The critical value is 2.201. (5)

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