4/51

2304E333

Candidate's Seat No :_____

IM.Sc. (AIML) (NEP) Sem.-4 Examination

DSC-C-AIML-241-T

Adv. Statistics for M.L.

April-2025

Time : 2-00 Hours] **[Max. Marks : 50**

- ❖ Read all questions carefully before attempting to answer.
- ❖ This question paper contains 05 questions.
- ❖ You may use a scientific calculator.
- ❖ All answers must be written neatly and legibly.
- ❖ Attempt all questions.

Q -1 (A) Explain type – I and type – II error [04]

Q -1 (B) A mobile company claims that the average battery life of their phone is 100 hours. A sample of 25 phones had a mean battery life of 105 hours with a standard deviation of 10 hours. Test the company's claim using a t-test at 5% significance level. (Given $t_{0.05} = 2.064$) [06]

OR

Q -1 (A) Explain the terms [04]

(1) Level of Significance

(2) Parameter and Statistics

(3) Degree of Freedom

(4) Confidence Interval

Q -1 (B) Ten individuals' weights (in kg) before and after a 4-week diet. Test whether the diet had a significant effect at 5% level. (Given $t_{0.05} = 2.262$) [06]

Person	1	2	3	4	5	6	7	8	9	10
Before	85	90	95	100	88	92	87	91	89	86
After	82	87	91	96	84	89	83	88	85	82

Q -2 (A) Explain Wilcoxon sign rank test [04]

Q -2 (B) A group of 8 individuals performed stretching exercises for 3 months. The heights (in cm) of the individuals before and after the exercise program were recorded. Test if there was a significant increase in height at the 5% level. Use sign test. [06]

Person	1	2	3	4	5	6	7	8
Before (cm)	170	160	165	172	168	174	169	162
After (cm)	171	161	166	173	169	175	170	163

P.T.O

OR

Q -2 (A) Explain sign test [04]

Q -2 (B) A car mechanic wants to check if tuning improved fuel efficiency (in km/l). Use Wilcoxon sign rank test. [06]

Car	1	2	3	4	5	6
Before	15.2	14.8	15	15.6	14.9	15.1
After	16.1	15.5	15.8	16.3	15.7	15.9

Q -3 (A) Explain F -test [04]

Q -3 (B) Exam Scores from Different Teaching Methods are determined. Test the variability at 5% level of significance (Given $F_{0.05} = 4.26$) [06]

Method 1	Method 2	Method 3
75	82	79
78	84	81
74	80	77
76	83	80

OR

Q -3 (A) Explain one-way ANOVA [04]

Q -3 (B) Test the variabilities between the operators and machines at 5% level of significance. (Given $F_{0.05} = 2.5$) [06]

Machines	Operate A	Operate B	Operate C
I	7	2	9
II	7	4	8
III	4	8	7
IV	6	3	8

Q -4 (A) Why there are two regression lines [04]

Q -4 (B) Find regression lines and estimate x when y is 100 [06]

X	102	103	103	107	99
Y	104	98	89	79	97

OR

Q -4 (A) Give properties of Regression Co-efficient [04]

Q -4 (B) Find regression lines and estimate y when x is 34 [06]

X	37	36	35	32	31	30
Y	30	39	35	38	31	38

Q -5 Answer the followings (Any Ten) [10]

1. Which of the following best describes the slope in a simple linear regression model?
   A) The predicted value of y when x = 0.
   B) The change in y for a one-unit increase in x.
   C) The intercept on the y-axis.
   D) The correlation between x and y.

2. The coefficient of determination (R^2) in regression analysis represents:
   A) The variance in x explained by y.
   B) The proportion of variance in y explained by x.
   C) The slope of the regression line.
   D) The standard error of the regression.

3. Which assumption of the linear regression model states that the variance of the residuals is constant across all levels of x?
   A) Linearity
   B) Independence
   C) Homoscedasticity
   D) Normality

4. A one-sample t-test is used to test whether:
   A) Two independent groups have the same mean.
   B) The mean of a single sample is equal to a hypothesized value.
   C) The variances of two samples are equal.
   D) Two paired samples differ significantly.

5. The paired t-test is most appropriately used when:
   A) Comparing two independent groups' means.
   B) Comparing measurements on the same subjects before and after an intervention.
   C) Comparing variances of two samples.
   D) Assessing the correlation between two continuous variables.

6. In a paired t-test, the test is performed on the differences between paired observations. The null hypothesis is that the mean difference is:
   A) Greater than zero.
   B) Less than zero.
   C) Equal to zero.
   D) Not equal to zero.

7. If a paired t-test yields a p-value of 0.03, and the significance level is 0.05, you should:
   A) Fail to reject the null hypothesis.
   B) Reject the null hypothesis.
   C) Accept the null hypothesis.
   D) Increase the sample size.

8. The Chi-Square test is most appropriately used for:
   A) Testing the difference in means between two groups.
   B) Testing the association between two categorical variables.
   C) Comparing a sample mean to a population mean.
   D) Evaluating the correlation between two continuous variables.

P. T. O

9. In a Chi-Square test for independence, the expected frequency for a cell in a contingency table is calculated as:
   A) (Row total + Column total) / Grand total
   B) (Row total × Column total) / Grand total
   C) (Row total - Column total) / Grand total
   D) (Row total ÷ Column total) × Grand total

10. The Wilcoxon Signed-Rank Test is used when the assumptions of the parametric paired t-test are violated, particularly when the differences are:
    A) Normally distributed.
    B) Not normally distributed.
    C) Categorical.
    D) Homoscedastic.

11. The null hypothesis in a Wilcoxon Signed-Rank Test states that:
    A) The mean difference is zero.
    B) The median difference is zero.
    C) The variance of the differences is equal to one.
    D) The sum of the ranks is zero.

12. In a sign test, observations with differences equal to zero are:
    A) Counted as positive.
    B) Counted as negative.
    C) Ignored.
    D) Doubled in the analysis.

_____ **** _____ **** ____ **** _____