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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: II - THEORY EXAMINATION (2025 - 2026)

Subject: Statistical Methods & Modelling

Time: 3 Hours

Max. Marks: 100

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C**. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.

2. Maximum marks for each question are indicated on right -hand side of each question.

3. Illustrate your answers with neat sketches wherever necessary.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A

20

1. Attempt all parts:-

- (1.1) One of the members of the population is known as the (CO1,K1) 1
- (a) Data
- (b) Family
- (c) Element
- (d) Group
- (1.2) We use non-probability sampling with the aim of _____. (CO1, K1) 1
- (a) Pilot studies
- (b) Qualitative research
- (c) Exploratory research
- (d) All the mentioned options
- (1.3) . If the values of two variables move in the same direction, _____ (CO2, K1) 1
- (a) The correlation is said to be non-linear
- (b) The correlation is said to be linear
- (c) The correlation is said to be negative
- (d) The correlation is said to be positive
- (1.4) For correlation analysis, which of the given assertions is true? (CO2, K1) 1
- (a) It is a multivariate analysis
- (b) It is a bivariate analysis
- (c) It is a univariate analysis
- (d) It is both bivariate and univariate analysis
- (1.5) A set of jointly sufficient statistics is defined to be minimal sufficient if and only if 1

(CO3, K1)

- (a) It is a function of every other set of sufficient statistics
- (b) It is not a function of every other set of sufficient statistics
- (c) It is a function of some other set of sufficient statistics
- (d) It is a function of any sufficient statistics in the set

(1.6) A single value used to estimate a population values is called (CO3, K1) 1

- (a) Interval estimate
- (b) Point estimate
- (c) Level of confidence
- (d) Degrees of freedom

(1.7) While performing Kruskal-Wallis test, the ranks are assigned: (CO4, K2) 1

- (a) Independently to the observation for each treatment
- (b) for observations in each block independently
- (c) by pooling all the observations
- (d) None of the above

(1.8) Unlike the non-parametric tests, Parametric test make certain assumptions about: (CO4,K1) 1

- (a) the sample size
- (b) the population size
- (c) the underlying distribution
- (d) None of the above

(1.9) The systematic components of time series which follow regular pattern of variations are called: (CO5,K1) 1

- (a) Augmented Dickey-Fuller test
- (b) Granger causality test
- (c) Box-plot method
- (d) Multiplicative model

(1.10) Which statistical method is used to identify the presence of outliers or anomalies in a time series data set? (CO5, K2) 1

- (a) Signal
- (b) Noise
- (c) Additive model
- (d) t-test

2. Attempt all parts:-

(2.1) What do you mean by sampling without replacement?(CO1, K2) 2

(2.2) What do you mean by linear regression?(CO2, K2) 2

(2.3) Define degree of freedom. (CO3,K2) 2

(2.4) What is Wilcoxon signed rank test? (CO4,K1) 2

(2.5) Define partial auto-correlation function. (CO5,K2) 2

SECTION-B 30

Answer any one of the following:-

- (3.1) What are the advantages of stratified random sampling?(CO1, K2) 6
- (3.2) Calculate the standard error of the given data- 14, 36, 45, 70, 105.(CO1,K2) 6

Answer any one of the following:-

- (3.3) Find Spearman's rank coefficient of correlation from the following data: (CO2, K3) 6
X: 50 66 34 21 15 79 42
Y: 31 64 53 41 17 73 29
- (3.4) Calculate Karl Pearson's coefficient of correlation from the following data and interpret its value: (CO2, K3) 6

Roll No.:	1	2	3	4	5
Marks in Accountancy:	48	35	17	23	47
Marks in statistics:	45	20	40	25	45

Answer any one of the following:-

- (3.5) Define an estimator and explain various types of estimators. Illustrate any two types with suitable examples. (CO3, K2) 6
- (3.6) In a hospital, 480 females and 520 male babies were born in a week. Do these figures confirm the hypothesis that males and females are born in equal number? (CO3, K3) 6

Answer any one of the following:-

- (3.7) Sample size 25, population SD=12. Sample mean=55. Find 99% confidence interval for population mean ($Z=2.576$). (CO4, K3) 6
- (3.8) Write a short note on alternative hypothesis. Elaborate with the help of an example. (CO4, K2)) 6

Answer any one of the following:-

- (3.9) Differentiate between AR and MA process. (CO5, K2) 6
- (3.10) Explain the test of testing stationarity. (CO5, K2) 6

SECTION-C

50

4. Answer any one of the following:-

- (4.1) A company inspects the durability of electric fans. Assume the population standard deviation is 150 hours. From a sample of 60 fans, the average lifespan is found to be 1400 hours.
(i) Compute the standard error of the sample mean.
(ii) Construct a 95% confidence interval for the population mean using $Z = 1.96$. (CO1, K3) 10
- (4.2) Explain sampling with replacement and without replacement. Elaborate with the help of an example.(CO1,K2) 10

5. Answer any one of the following:-

- (5.1) In a correlation study, the following values are obtained: 10

	X	Y
Mean	65	67
Standard deviation	2.5	3.5

Coefficient of correlation	0.8
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Find the two regression equations that are associated with the above values. (CO2, K3)

- (5.2) Making use of data summarized below, calculate the coefficient of correlation, r_{12} . (CO2, K3) 10

Case:	A	B	C	D	E	F	G	H
X_1 :	10	6	9	10	12	13	11	9
X_2 :	9	4	6	9	11	13	8	4

6. Answer any one of the following:-

- (6.1) The lifetime of electric bulbs for a random sample of 10 from a large consignment gave the following data: 10

Item	1	2	3	4	5	6	7	8	9	10
Life in '000 hours	4.2	4.6	3.9	4.1	5.2	3.8	3.9	4.3	4.4	5.6

Can we accept the hypothesis that the average lifetime of bulbs is 4,000 hours? (CO3,K3)

- (6.2) What is sufficient estimator? Show that in estimating for the parameter μ in the Poisson distribution with general term $\frac{e^{-\mu} \mu^x}{x!}$, $\bar{x}$ is sufficient estimator for μ . (CO3, K3) 10

7. Answer any one of the following:-

- (7.1) The scores of two classes are given below: 10

Class A: 70, 75, 80, 85, 90, 95, 65, 68, 72

Class B: 73, 78, 79, 82, 87, 90, 66, 70, 75

Test at the 5% significance level whether the variances of the two classes are equal using the **F-test**.

Given: $F(0.025, 8, 8) = 4.43$. (CO4, K3)

- (7.2) A survey is conducted among **100 individuals** to see if there is a relationship between **gender** and **beverage preference** (Tea or Coffee). The results are summarized below: (CO4, K3) 10

Category Male Female Total

Tea 30 10 40

Coffee 20 40 60

Total 50 50 100

Critical value: $\chi_{0.05, 12} = 3.841$

8. Answer any one of the following:-

- (8.1) Describe the differencing in ARIMA. Write the importance of differencing. (CO5,K2) 10

- (8.2) What are the mathematical models of time series? Explain. (CO5,K2) 10