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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: Biostatistics

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) Which method is best when population is scattered geographically? (CO1, K1) 1
- (a) Snowball sampling
 - (b) Cluster sampling
 - (c) Systematic sampling
 - (d) Quota sampling
- (1.2) A grouped frequency distribution is used when: (CO1, K1) 1
- (a) Data is qualitative
 - (b) Data is large and continuous
 - (c) Data is very small
 - (d) Data is not needed
- (1.3) The regression coefficients are denoted by: (CO2, K2) 1
- (a) r and R
 - (b) b_{xy} and b_{yx}
 - (c) $\bar{x}$ and $\bar{y}$
 - (d) None
- (1.4) The value of Pearson's correlation coefficient lies between: (CO2, K1) 1
- (a) 0 and 1
 - (b) -1 and 1
 - (c) $-\infty$ and ∞
 - (d) 0 and ∞
- (1.5) If $X \sim \text{Binomial}(n = 10, p = 0.2)$, then $E(X) = ?$ (CO3, K2) 1

- (a) 1
(b) 2
(c) 3
(d) 4
- (1.6) The normal distribution is symmetric about: (CO3, K2) 1
(a) Mode
(b) Mean
(c) Median
(d) All of these
- (1.7) What is the full form of H_0 ? 1
(a) High value hypothesis
(b) Null hypothesis
(c) Hypothesis zero
(d) Zero assumption
- (1.8) Which of the following is a non-parametric test? (CO4, K1) 1
(a) t-test
(b) Z-test
(c) Chi-square test
(d) ANOVA
- (1.9) If all points lie within limits, process is (CO5, K1) 1
(a) Out of control
(b) Stable
(c) Defective
(d) Reject
- (1.10) Mean chart used for (CO5, K1) 1
(a) Defects
(b) Attributes
(c) Continuous
(d) Discrete

2. Attempt all parts:-

- (2.1) Draw a rough sketch of a bar diagram. (CO1, K2) 2
(2.2) Define random variable. (CO2, K2) 2
(2.3) Find the mean of a binomial distribution with $n = 10$ and $p = 0.6$. (CO3, K1) 2
(2.4) Why is the level of significance important in hypothesis testing? (CO4, K2) 2
(2.5) Explain with a suitable example the use of control charts in manufacturing. (CO5, K2) 2

SECTION-B

30

Answer any one of the following:-

- (3.1) A hospital has a total of 50 patients. Select a sample of 10 patients using the simple random sampling method. Explain the procedure involved in selecting this sample. 6

(CO1, K3)

- (3.2) Draw all graphs for:(CO1, K3) 6

Class Interval	0-10	10-20	20-30	30-40
Frequency	3	5	6	4

Answer any one of the following:-

- (3.3) Find the best fitting line $y = a + bx$ using normal equations for given data. 6

X: 1, 2, 3, 4, 5, 6

Y: 2, 1, 4, 3, 6, 5 (CO2, K3)

- (3.4) Calculate Spearman's rank correlation coefficient for the following data: 6

Marks in Statistics: 45, 55, 48, 60, 50, 52

Marks in Mathematics: 40, 60, 42, 65, 45, 50 (CO2, K3)

Answer any one of the following:-

- (3.5) Define the Probability Mass Function (PMF) and Probability Density Function (PDF) for the following distributions: (i) Binomial Distribution (ii)Poisson Distribution(iii)Normal Distribution. Also mention whether each distribution is discrete or continuous. (CO3, K2) 6

- (3.6) What is the area to the right of $Z = 0.84$? ($P(Z > 0.84)$), also plot graphical representation. 6

Use: $P(Z < 0.84) = 0.7995$ (CO3, K3)

Answer any one of the following:-

- (3.7) Three different teaching methods are applied to three groups of students. Their scores are: 6

Group A: 55, 56, 58

Group B: 52, 54, 53

Group C: 60, 61, 59

Test whether the means are significantly different using one-way ANOVA. The **critical value** is: $F(0.05, 2, 6) = 5.14$ (CO4, K3)

- (3.8) A sample of size 36 has a mean of 50 and standard deviation of 6. Test the hypothesis that the population mean is 52 at 5% level of significance. Critical value=1.96 (CO4, K3) 6

Answer any one of the following:-

- (3.9) A production line checks 10 samples each of size 50 and finds an average of 5 defectives per sample. Calculate the control limits for the np-chart.(CO5,K3) 6

- (3.10) The average range for samples of size 6 is 4.5. Calculate the control limits for the R-chart. (Take $D_3 = 0$, $D_4 = 2.004$)(CO5,K3) 6

SECTION-C 50

4. Answer any one of the following:-

- (4.1) Explain the importance of graphical presentation in data analysis. Discuss how graphical methods help in understanding data patterns, identifying trends, and communicating results effectively.(CO1, K2) 10

- (4.2) The following data represent the number of books read by 30 students in a month: 10

3, 5, 2, 4, 6, 3, 5, 4, 7, 3, 5, 4, 6, 2, 3, 5, 4, 7, 6, 3, 4, 5, 2, 6, 4, 3, 5, 7, 6, 4.

Construct a frequency distribution table from this data and analyse it by drawing a bar chart and a frequency curve. Ensure that all graphs are properly labelled and

titled.(CO1, K3)

5. Answer any one of the following:-

- (5.1) Interpret the correlation coefficient for the following data of daily exercise hours (X) and calories burned (Y) for 6 individuals: 10
X:1,2,3,4,5,6
Y:150,200,250,300,350,400 (CO2, K3)
- (5.2) Compute all measures of central tendency (mean, median, mode) and interpret for dataset: 3, 6, 6, 7, 8, 10, 10, 15. (CO2,K3) 10

6. Answer any one of the following:-

- (6.1) A fair coin is tossed 8 times. Let the random variable X denote the number of heads obtained. (i)Define the random variable X clearly and write its possible values. 10
(ii)Find the probability that X is at least 5 (iii)Find the probability that X is at most 3. (CO3,K3)
- (6.2) For a binomial distribution with parameters $n = 8$ and $p = 0.3$, compute and tabulate the entire PMF and CDF. (CO3, K3) 10

7. Answer any one of the following:-

- (7.1) A teacher wants to determine whether the variability in math test scores is the same for two classes, Class A and Class B. The test scores (out of 100) for the students in both classes are given below: 10

Student No.	1	2	3	4	5	6	7	8	9
Class A Score	78	82	65	90	75	85	70	88	77
Class B Score	80	85	78	82	84	79	81	77	83

At the 5% significance level, test whether the variances of the two classes are equal using the F-test.
 $F(0.025,8,8)=4.43$ (CO4, K3)
- (7.2) Conduct full ANOVA analysis on: 10
Group A: [10, 12, 11];
Group B: [14, 13, 15];
Group C: [12, 11, 13]. **Critical value:** $F\{0.05, 2, 6\} = 4.74$ (CO4, K3)

8. Answer any one of the following:-

- (8.1) Discuss in detail the advantages, limitations, and applications of Statistical Quality Control techniques in modern industries.(CO5,K3) 10
- (8.2) A factory inspected 25 samples each of size 100 and found a total of 120 defective items. Construct a p-chart and determine whether the process is under control.(CO5,K3) 10