Printed Page:-04 **Subject Code:- BCSBS0105**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: I - THEORY EXAMINATION (2024 - 2025)

Subject: Introductory Topics in Statistics, Probability and Calculus

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-a. Any measure of the population is called: (CO1, K1) 1

(a) Finite
(b) Parameter
(c) Without replacement
(d) Random

1-b. List of all the units of the population is called: (CO1, K1) 1

(a) Random Sampling
(b) Bias
(c) Sampling frame
(d) Probability Sampling

1-c. If there is a very strong correlation between two variables then the correlation coefficient must be: (CO2, K2) 1

(a) Any value larger than 1
(b) Much smaller than 0, if the correlation is negative
(c) Much larger than 0, regardless of whether the correlation is negative or positive
(d) None of these alternatives is correct

1-d. What does the standard deviation measure in a dataset? (CO2, K2) 1

(a) The spread or dispersion of data points around the mean
(b) The central value of the dataset

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(c) The total range of the dataset

(d) The frequency of each data point in the dataset

1-e. In a random experiment of rolling a die and observing the number shown up, let A be the event "odd number showing up". Then A = (CO3, K2) 1

(a) {1,2,3,6}

(b) {1}

(c) {1,3,5}

(d) {2,6}

1-f. What is the conditional probability of event A given that event B has occurred, denoted P(A/B)? (CO3, K1) 1

(a) P(A + B) / P(B)

(b) P(A) / P(B)

(c) P(A ∪ B) / P(B)

(d) P(A ∩ B) / P(B)

1-g. For a Poisson distribution $\rho(x) = \frac{e^{-2}(2)^3}{3!}$, the mean value is: (CO4, K2) 1

(a) 1

(b) 2

(c) 3

(d) 4

1-h. For a standard normal probability distribution, the mean μ and the standard deviation (s) are: (CO4, K2) 1

(a) $\mu = 0$ and $s = 1$

(b) $\mu = 16$ and $s = 4$

(c) $\mu = 25$ and $s = 5$

(d) $\mu = 100$ and $s = 10$

1-i. Integrate $\int_0^2 (x^2 + x + 1)dx$ (CO5, K2) 1

(a) 15/2

(b) 20/5

(c) 20/3

(d) 3/20

1-j. Evaluate $\int_0^1 \int_1^2 \int_2^3 xyz \, dxdydz$. (CO5, K2) 1

(a) 12/7

(b) 15/8

(c) 1

(d) 0

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2. Attempt all parts:-

2.a. What is the difference between finite and infinite population? (CO1, K1) 2

2.b. Define Descriptive statistics. (CO2, K1) 2

2.c. Two dice are tossed once, find the probability of getting an even number on the first dice or a total of 8. (CO3, K2) 2

2.d. 20% Of the bulbs produced are defective. What is probability that at most 2 bulbs out of 4 bulbs are defective? (CO4, K3) 2

2.e. If $y = e^{2x+3}$, find $\frac{d^3y}{dx^3}$. (CO5, K2) 2

SECTION-B 30

3. Answer any five of the following:-

3-a. Discuss the process of data collection and compare the advantages and disadvantages of primary and secondary data. (CO1, K1) 6

3-b. What are the different applications of statistics in various branches of science? Provide examples.(CO1, K1) 6

3-c. What is frequency curve in statistics? Explain with an example? (CO2, K1) 6

3-d. Calculate the variance and standard deviation for the following data: (CO2, K2) 6

Marks range	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	5	8	12	10	7	5	3

3.e. A has 2 shares in a lottery in which there are 3 prizes and 5 blanks; B has 3 shares in a lottery in which there are 4 prizes and 6 blanks. Show that A's chance of success is to B's as 27:35. (CO3, K3) 6

3.f. 100 Electric bulbs are found to be defective in a lot of 5000 bulbs. What is probability that at the most 3 bulbs are defective in a box of 100 bulbs? (CO4, K3) 6

3.g. Evaluate the integral $\int_0^1 \int_0^{\sqrt{1+x^2}} \frac{dydx}{1+x^2+y^2}$. (CO5, K2) 6

SECTION-C 50

4. Answer any one of the following:-

4-a. Define the following- (CO1, K1) 10

i. Cluster sampling
ii. Multi-stage sampling
iii. Stratified sampling
iv. Quota sampling

4-b. Define statistics. Discuss its Scope and Limitation. (CO1, K1) 10

5. Answer any one of the following:-

5-a. The annual salaries of a group of employees are given in the following table: (CO2, K2) 10

Salaries (in Rs '000)	45	50	55	60	65	70	75	80
No. of persons	3	5	8	7	9	7	4	7

Calculate the standard deviation of the salaries.

5-b. What are the differences among the mean, median and mode and what are the advantages and disadvantages of each? (CO2, K1) 10

6. Answer any <u>one</u> of the following:-

6-a. The contents of urns I, II and III are as follows:1 white, 2 black and 3 red balls,2 white, 1 black and 1 red ball and 4 white, 5 black and 3 red balls. One urn is chosen at random and two balls drawn. They happen to be white and red. What is the probability that they come from urns I, II or III? (CO3, K3) 10

6-b. In Class XI of a school 40% of the students study Mathematics and 30% study Biology. 10% of the class study both Mathematics and Biology. If a student is selected at random from the class, find the probability that he will be studying Mathematics or Biology. (CO3, K3) 10

7. Answer any <u>one</u> of the following:-

7-a. The distribution function of a random variable X is given by- 10

$$F(x) = \begin{cases} 0, & x < 0 \\ cx^3, & 0 \le x \le 3 \\ 1, & x \ge 3 \end{cases}$$

Find- (CO4, K3)

I. The constant
II. The density function
III. $P(X > 1)$
IV. $P(1 < X < 2)$

7-b. If 10% of bolts are produced by a machine are defective, determine the probability that out of 10 bolts chosen at random, 10
(i) 1 bolt (ii) None and (iii) At most 2 bolts, will be defective.(CO4, K3)

8. Answer any <u>one</u> of the following:-

8-a. Evaluate $\iiint x^2yz \, dxdydz$ over the region bounded by $1 < x < 2, 0 < y < 2, \text{and } 1 < z < 2$. (CO5, K3) 10

8-b. Evaluate $\int\int_A xy \, dxdy$ over the positive quadrant of the circle $x^2 + y^2 = a^2$. (CO5, K3) 10