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 (2023-2024)

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) 1

(a) Finite

(b) Parameter

(c) Without replacement

(d) Random

1-b. Any calculation on the sampling data is called: (CO1) 1

(a) Parameter

(b) Static

(c) Error

(d) Random Sampling

1-c. In a dataset, if the mean is greater than the median, what can you infer about the data distribution? (CO2) 1

(a) The distribution is positively skewed

(b) The distribution is negatively skewed

(c) The distribution is symmetric

(d) The distribution cannot be determined from these statistics

1-d. In a week the prices of a bag of rice were 350, 280, 340, 290, 320, 310, 300. The range is (CO2) 1

(a) 70

(b) 60
(c) 100
(d) 90

1-e. The set of all possible outcomes of an experiment is called: (CO3) 1

(a) Event
(b) Probability
(c) Sample space
(d) Complement

1-f. Bayes' Theorem is used to calculate: (CO3) 1

(a) Conditional probability
(b) Marginal probability
(c) Joint probability
(d) Prior probability

1-g. Two dice are rolled. Let X is the maximum of the numbers that turns up. If P(X) represents the probability mass function, what is P(X=3)? (CO4) 1

(a) 1/36
(b) 5/36
(c) 3/36
(d) 7/36

1-h. What is the expected value of the binomial distribution where n=16 and p=0.85? (CO4) 1

(a) 6
(b) 7.4
(c) 12.4
(d) 13.6

1-i. 1

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

(a) 12/7
(b) 15/8
(c) 1
(d) 0

1-j. 1

Evaluate $\int_0^1 \int_0^1 \frac{dxdy}{\sqrt{(1-x^2)(1-y^2)}}$. (CO5)

(a) π^2
(b) $\frac{\pi^2}{2}$
(c) $\frac{\pi^2}{4}$

(d) None of the above

2. Attempt all parts:-

2.a. What are the types of sampling? (CO1) 2

2.b. The mean of 11 numbers is 7. One of the numbers, 13, is deleted. What is the mean of the remaining 10 numbers? (CO2) 2

2.c. If P(A) = 3/5 and P (B) = 1/5, find P (A∩B) if A and B are independent events. (CO3) 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) 2

2.e. Find the value of y_2 if $y = \cos(x^2 + 2)$. (CO5) 2

SECTION-B 30

3. Answer any five of the following:-

3-a. What are the advantages and disadvantages of simple random sampling? (CO1) 6

3-b. What is the scope of statistics? (CO1) 6

3-c. A class of five students write a test and the results are as follows 58, 25, 67, 90 and 76 marks. Find the quartiles and interquartile range. (CO2) 6

3-d. The price of a selected stock over a five days period is shown as 170, 110, 170, 156 and 160. Compute the mean, median and mode. (CO2) 6

3.e. Events A and B are such that P (A) = 1/2, P(B) = 7/12 and P (not A or not B) =1/4. State whether A and B are independent? (CO3) 6

3.f. A bag contains 20 balls of which are 15 are of red color and 5 of black color. A random sample (without replacement) of 5 balls is taken. Find the probability that the sample contains 2 black balls. (CO4) 6

3.g. If $y = e^{\sin^{-1}x}$ Prove that $(1-x^2)y_2 - xy_1 - y = 0$. (CO5) 6

SECTION-C 50

4. Answer any one of the following:-

4-a. What are the different methods of collecting data in statistics? (CO1) 10

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

5. Answer any one of the following:-

5-a. Calculate: Mean Deviation (M.D.), for the following data: (CO2) 10

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No. of students	6	5	8	15	7	6	3

5-b. Find the value of mean of the following distribution: (CO2) 10

Weight (in kg)	93-97	98-102	103-107	108-112	113-117	118-122	123-127	128-132
No. of students	3	5	12	17	14	6	3	1

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) 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) 10

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

7-a. If the Variance of the Poisson distribution is 2, find the probability for r=1,2,3,4 from the recurrence relation of the Poisson Distribution. Also find $P(r \geq 4)$. (CO4) 10

7-b. In a bolt factory machines A, B and C manufacture 25%,35% and 40% of the total. Of their output 5%,4% and 2% are defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by machines A, B or C? (CO4) 10

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

8-a. Change the order of integration and evaluate: $\int_0^1 \int_{x^2}^{2-x} xy \, dydx$. (CO5) 10

8-b. Evaluate $\iint e^{2x+3y} \, dxdy$ over the triangle bounded by $x=0, y=0$ and $x+y=1$. (CO5) 10