Printed Page:-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. 20 **SECTION-A** 1. Attempt all parts:-1-a. Which among the following is the benefit of using simple random sampling? 1 (CO1, K1) The results are always representative. (a) Interviewers can choose respondents freely (b) Informants can refuse to participate. (c) We can calculate the accuracy of the results. (d) 1-b. The difference between a statistic and the parameter is called: (CO1, K1) 1 (a) Non-random Probability (b) Sampling error (c) Random (d) A histogram gives ______ nature of process variability. (CO2, K1) 1 1-c. (a) Dynamic (b) Static (c) Negative (d) Positive Which measure of central tendency is best used for categorical data? (CO2, K2) 1-d. 1 (a) Mode Median (b)

- (c) Mean
- (d) Standard deviation

1-e. Which of the following is not always true for a random experiment? (CO3, K1) 1

- (a) Outcomes cannot be predicted in advance
- (b) Outcomes are equally likely
- (c) It has more than one possible outcome
- (d) It can be repeated under identical conditions
- 1-f. If P(A) = 0.4 and P(B) = 0.3 and they are independent then what is the probability 1 of occurring of both events A and B? (CO3, K2)

1

1

1

1

- (a) 0.7
- (b) 0.12
- (c) 0.2
- (d) 0.1
- 1-g. Let X be the number of tails obtained on tossing 3 coins. S={HHH, HHT, HTH, THH, HTT, THT, TTH, TTT}. X takes values 0,1,2 and 3. If F is the distribution function of the random variable X, what is F(2)? (CO4, K2)
 - (a) 1/8
 - (b) 1/2
 - (c) 3/8
 - (d) 1

1-h. 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, K2)

(CO5, K2)

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

1-i.

1-j.

Evaluate $\int_{1} \int_{0} (x+y) dx$

- (a) 2
- (b) -2
- (c) -1
- (d) 1
 - $\int \cot^2 x \, dx$ equals to (CO5, K2)
- (a) cotx-x+c
- (b) $-\cot x x + c$
- (c) $\cot x + x + c$
- (d) $-\cot x + x + c$

2. Attempt all parts:-	
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2.a.	What is the difference between sample with replacement and without
	replacement? (CO1, K1)

- 2.b. Define classification. (CO2, K1)
- 2.c. Find the probability that the Leap Year selected at random will contain 53 Sundays. (CO3, K2)
- 2.d. A discrete random variable X has the following distribution. (CO4, K2)

X	1	2	3	4	5	6	7
P(X)	K	2K	2K	3K	K^2	$2K^2$	$7K^2 + K$
What is th	ne value o	f K?					

2

2

2

2

2

30

6

6

2.e.

Evaluate
$$\int_{0}^{1} \int_{0}^{x} e^{x} dy dx$$
 (CO5, K2)

SECTION-B

3. Answer any five of the following:-

- 3-a. Give an example of how statistics is used in economics and explain its importance. 6 (CO1, K2)
- 3-b. What do you mean by primary and secondary data? What are the types of primary 6 and Secondary data? (CO1, K1)
- 3-c. Calculate the coefficient of Range and third quartile from the following data: (CO2, K2)

Marks	No. of	Estudents
10-20	8	
20-30	10	
30-40	12	
40-50	8	
50-60	4	

3-d. Find the coefficient of skewness from the following distribution: (CO2, K2)

Difference of two quartiles= 8, Mode= 11, Sum of two quartiles= 22, Mean= 8

3.e. Check whether the following probabilities P(A) and P(B) are consistently defined 6 (CO3, K2)

(i) P(A) = 0.5, P(B) = 0.7, $P(A \cap B) = 0.6$ (ii) P(A) = 0.5, P(B) = 0.4, P(AUB) = 0.8

3.f. Find the mean and variance of a random variable whose p.d.f. is given by- (CO4, 6 K2)

$$f(x) = \frac{1}{2}x^2 e^{-x}, x > 0.$$

3.g.
$$\int_{0}^{1} \int_{0}^{\sqrt{(1+x^{2})}} \frac{dydx}{(1+x^{2}+y^{2})} (CO5, K2)$$

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SECTION-C

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

- 4-a. What are the different methods of collecting Primary and secondary data in 10 statistics? Explain with suitable examples.(CO1, K1)
- 4-b. Define statistics. Discuss its Scope and Limitation. (CO1, K1)
- 5. Answer any one of the following:-

5-a.	Calculate: Mean Deviation (M.D.), for the following data: (CO2, K2)	
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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			

Find the value of mean, median and mode of the following distribution: (CO2, K2) 5-b. 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 one of the following:-

6-a. State Baye's Theorem. In bolt factory, Machines A, B and C manufacture 10 respectively 25%, 35% and 40% of the total. Of their output 5,4 and 2 percent are defective bolts. A bolt is drawn at random from the product and is found to be defective. What is the probability that it was manufactured by machine B. (CO3, K3)

- 6-b. Two students Anil and Ashima appeared in an examination. The probability that 10 Anil will qualify the examination is 0.05 and that Ashima will qualify the examination is 0.10. The probability that both will qualify the examination is 0.02. Find the probability that (CO3, K3)
 - (a) Both Anil and Ashima will not qualify the examination.
 - (b) At least one of them will not qualify the examination and
 - (c) Only one of them will qualify the examination.
- 7. Answer any one of the following:-

A random variable X has the following probability mass function: (CO4, K3) 7-a. 10

x 0	1	2	3	4	5	6	7
p(x) = 0	k	2k	2k	3k	\mathbf{k}^2	$2k^2$	$7k^2 + k$

I. Find k.

II. Evaluate P(X < 6), $P(X \ge 6)$ and P(0 < X < 5).

$$P(X \leq a) \geq$$

III. If $P(X \le a) > \frac{1}{2}$ find the minimum value of *a*.

Determine the distribution function of X.

7-b. In 800 families with 5 children each, how many families would be expected to 10

10

10

have- (CO4, K3)

- I. 3 boys and 2 girls II. 2 boys and 3 girls III. No girl
- IV. At most 2 girls. (Assume probabilities for boys and girls to be equal)

8. Answer any one of the following:-

8-a.

- Evaluate $\iint (\mathbf{x}^2 + \mathbf{y}^2) \, d\mathbf{x} \, d\mathbf{y}$ over the region in the positive quadrant for which $\mathbf{x} + \mathbf{y} \le \mathbf{1}$. (CO5, K3)
- 8-b. Evaluate the area enclosed between the parabola $y = x^2$ and the straight line y = x. 10 (CO5, K3)

REGINITION