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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: I - CARRY OVER THEORY EXAMINATION - MAY 2023

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

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1. Attempt all parts:-

- 1-a. A randomly selected sample of 400 students at a university with 15-week semesters was asked whether or not they think the semester should be shortened to 14 weeks (with longer classes). Forty six percent (46%) of the 400 students surveyed answered "yes." Which one of the following statements about the number 46% is correct? [CO1] 1
- (a) It is a sample statistic.
- (b) It is a population parameter.
- (c) It is a margin of error.
- (d) It is a standard error.
- 1-b. The mistake when using secondary data effectively [CO1] 1
- (a) To assume it is right
- (b) To combine it with other data
- (c) To evaluate its usefulness
- (d) To locate it via people

- 1-c. Sum of the deviations of a variable from its mean is always [CO2] 1
- (a) 0
 - (b) 1
 - (c) 2
 - (d) 5
- 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) 60
 - (b) 90
 - (c) 70
 - (d) 100
- 1-e. In a random experiment of selecting a red bead from a bag with five beads of colours red, white, blue, green and yellow, probability of "getting a red bead" is [CO3] 1
- (a) $\frac{1}{6}$
 - (b) $\frac{1}{5}$
 - (c) $\frac{3}{5}$
 - (d) $\frac{1}{3}$
- 1-f. If $P(A)=0.7, P(B)=0.2, P(A \cap B)=0.2$, what is the probability that neither A nor B occurs? [CO3] 1
- (a) 0.3
 - (b) 0.2
 - (c) 0.8
 - (d) 0.7
- 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] 1
- (a) $\frac{1}{8}$
 - (b) $\frac{1}{2}$
 - (c) $\frac{7}{8}$
 - (d) 1
- 1-h. The probability distribution function of a continuous random variable X is defined by 1

$$f(x) = \begin{cases} \frac{A}{x^3}, & 5 \leq x \leq 10 \\ 0, & \text{otherwise} \end{cases}$$

Then the value of A is [CO4]

- (a) 100/3
- (b) 200/3
- (c) 50/3
- (d) None of these

1-i. $\int \frac{dx}{\sqrt{x}} =$ [CO5] 1

- (a) $\sqrt{x} + k$
- (b) $2\sqrt{x} + k$
- (c) $x + k$
- (d) None of these

1-j. $\int_0^2 \frac{dx}{x^2 + 4}$ [CO5] 1

- (a) $\pi/8$
- (b) $\pi/2$
- (c) $\pi/4$
- (d) None of these

2. Attempt all parts:-

- 2.a. Define Primary data with an example? [CO1] 2
- 2.b. What are the different types of graphical representation? [CO2] 2
- 2.c. Check whether the following statement is true or false:
A die is rolled. Let E be the event "die shows 4" and F be the event "die shows even number". The event E and F are mutually exclusive. (T/F) [CO3] 2
- 2.d. Find the binomial distribution whose mean is 6 and variance is 4 [CO4]. 2
- 2.e. Evaluate $\int (y + \sqrt[3]{y}) dy$ [CO5] 2

SECTION B

30

3. Answer any five of the following:-

- 3-a. Define sampling. Explain the different methods of sampling. [CO1] 6
- 3-b. How Statistics helps in formulation of plans and policies? [CO1] 6

- 3-c. Find the probability distribution of (X+Y) given the bivariate distribution of: 6

[CO2]

X/Y	1	2
1	0.1	0.2
2	0.3	0.4

- 3-d. A football player scored the following number of goals in the 10 matches: 6

[CO2]

1, 3, 2, 5, 8, 6, 1, 4, 7, 9

Since the number of matches is 10 (an even number), therefore, the median
= (5th observation + 6th observation)/2 = (8+6)/2 = 7

Is it the correct answer and why?

- 3.e. Let E and F be events with $P(E) = 3/5$, $P(F) = 3/10$ and $P(E/F) = 1/5$. Are E and F independent? **[CO3]** 6

- 3.f. If there are 3 misprints in a book of 1000 pages find the probability that a given page will contain 6

i. No misprint

ii. More than 2 misprints **[CO4]**

- 3.g. If $y = a \cos mx + b \sin mx$ then show that $y_2 + m^2 y_1 = 0$ **[CO5]** 6

SECTION C

50

4. Answer any one of the following:-

- 4-a. Indicate the utility of statistics in economic planning of India. Discuss the statement by giving suitable examples. **[CO1]** 10
- 4-b. What is data? Discuss the methods of collection of primary and secondary data. What is the utility of primary data in statistics? **[CO1]** 10

5. Answer any one of the following:-

- 5-a. Find the median wage of the following distribution: **[CO2]** 10

Wages (in Rs): 2,000-3,000, 3,000-4,000, 4,000-5,000, 5,000-6,000, 6,000-7,000

No of workers: 3 5 20 10 5

- 5-b. After shift of origin and change of scale, a frequency distribution of a continuous variate takes the form as under: **[CO2]** 10

Step deviation : -4 -3 -2 -1 0 1 2 3

Frequency : 2 5 7 13 21 16 8 3

If the mean and variance of the distribution are respectively 21.9 and 63.9725, find the original frequency distribution.

6. Answer any one 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 balls 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. Assume that each born child is equally likely to be a boy or a girl. If a family has two children, what is the conditional probability that both are girls given that (i) the youngest is a girl, (ii) at least one is a girl? [CO3] 10

7. Answer any one of the following:-

- 7-a. In 800 families with 5 children each, Assuming probabilities for boys and girls to be equal, how many families would be expected to have- 10
- I. 3 boys and 2 girls
 - II. 2 boys and 3 girls
 - III. No girl
 - IV. At most 2 girls. [CO4]

- 7-b. In a distribution exactly Normal, 31% of the items are under 45 and 8% are over 64. What are the mean and Standard deviation of this Distribution? It is given that if $f(t) = 1/\sqrt{2\pi} \int_0^t e^{-x^2/2} dx$ then $f(0.5) = 0.19$, $f(1.4) = 0.42$. [CO4] 10

8. Answer any one of the following:-

- 8-a. Evaluate $\int_0^4 \int_0^{2\sqrt{z}} \int_0^{\sqrt{4z-x^2}} dy dx dz$ [CO5] 10
- 8-b. Evaluate $\iint y dx dy$ over the region bounded by the parabolas $x^2 = 4y$ and $y^2 = 4x$. [CO5] 10