Printed page: 4 **Subject Code: CBCA0203**

Roll No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

BCA

SEM: II - THEORY EXAMINATION (2025-2026)

Subject: Statistics for Computer Applications

Time: 3 Hours **Max. Marks:100**

General Instructions:

IMP: Verify that you have received question paper with 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) If mean > median > mode, then skewness is: (CO1,K1) 1

(a) Symmetric (b) Negative (c) Positive (d) Uniform

(1.2) If regression coefficients are $b_{yx} = 0.8$ and $b_{xy} = 0.2$, then r is (CO1,K3) 1

(a) 0.4 (b) 0.6 (c) 0.8 (d) 0.16

(1.3) A random variable has PMF $P(X = x) = kx^2$, $x = 1,2,3$. Then k equals :(CO2,K3) 1

(a) 1/14 (b) 1/9 (c) 1/6 (d) 1/10

(1.4) If $E(X) = 4$, $Var(X) = 3$, then $E(3X - 2)$is: (CO2,K3) 1

(a) 12 (b) 10 (c) 8 (d) 6

(1.5) A box contains electric bulbs, where a proportion p is defective and a proportion q = 1 - p are non-defective. A bulb is drawn at random. Let the random variable x take the value 1 if the bulb is defective and 0 otherwise. Which of the following statement is incorrect? (CO3,K2) 1

(a) The expectation $E(x)$ is equal to p.
(b) The expectation $E(x^2)$ is equal to p.
(c) The variance of x is equal to pq.
(d) The variance of x is equal to $p^2 - p$.

(1.6) Consider the tossing of a fair coin. Find the probability of getting exactly two heads (in any order) on the three tosses of the fair coin. (CO3, K3) 1

(a) $1/8$. (b) $3/8$. (c) $1/2$. (d) $3/4$.

(1.7) Choose the correct option for test statistic of one sample t-test under null hypothesis, where $\bar{x}$ is sample mean, μ is population mean, S is sample standard deviation, and n is size of random sample. (CO4,K1) 1

(a) $\frac{\bar{x}-\mu_0}{S/\sqrt{n}}$
(b) $\frac{\bar{x}-\mu_0}{S/n}$
(c) $\frac{\bar{x}-\mu_0}{n/S}$
(d) $\frac{\bar{x}-\mu_0}{S/(n-1)}$

(1.8) The rejection probability of null hypothesis when it is true is called as (CO4,K1) 1

(a) Level of confidence (b) Level of significance
(c) Level of margin (d) Level of acceptance

(1.9) A man's present age is two-fifths of the age of his mother. After 8 years, he will be one-half of the age of his mother. How old is the mother at present? (CO5,K3) 1

(a) 40 (b) 38 (c) 36 (d) 42

(1.10) A milk vendor has 50 L of milk and supplies 5 L to every customer. After each transaction he adds 5 L of water. What is the % of milk contained in a litre of solution purchased by the 5^{th} customer? (CO5, K3) 1

(a) 65.6% (b) 32.8% (c) 66.2% (d) None of the above

2. Attempt all parts:-

(2.1) If $\mu_2 = 9$ and $\mu_4 = 243$, find β_2 and state the type of kurtosis (CO1,K2) 2

(2.2) Define discrete and continuous random variables with one example each. (CO2,K1) 2

(2.3) A doctor recommends a patient to go on a particular diet for two weeks and there is equal likelihood for the patient to lose her weight between 2kg and 4kg. What is the average amount the patient is expected to lose on this diet? (CO3, K3) 2

(2.4) State null and alternate hypothesis for a hypothesis test will be used to potentially provide evidence that the population mean is more than 10. (CO4,K2) 2

(2.5) Suppose that there are 9 faculty members in the mathematics department and 11 in the computer science department. How many ways are there to select a committee to develop a discrete mathematics course at a school if the committee is to consist of three faculty members from the mathematics department and four from the computer science department? (CO5, K3) 2

SECTION – B 30

Answer any <u>one</u> of the following-

(3.1) Find the correlation coefficient between x and y, when the lines of regression are : $2x - 9y + 6 = 0$ and $x - 2y + 1 = 0$. (CO1,K3) 6

(3.2) Compute the first four moments about mean for given data (CO1,K3) 6

x	3	6	12	16	25
f	1	2	3	4	5

Answer any <u>one</u> of the following-

(3.3) An underground mine has 5 pumps installed for pumping out storm water; the probability of any one of the pumps failing during the storm is $1/8$. What is the probability that 6

(i) at least 2 pumps will be working;
(ii) all the pumps will be working during a particular storm? (CO2,K3)

(3.4) Two dice are tossed. Find the probability that total score is a prime number.(CO2,K3) 6

Answer any <u>one</u> of the following-

(3.5) Consider an emergency room of a small rural hospital where the past records indicate an average of 5 arrivals daily. The demand for emergency room service at this hospital is distributed according to the Poisson distribution. Calculate the probability of exactly 0, 1, 2, 3, 4, and 5 arrivals. What is the probability of more than 3 arrivals? (CO3,K3) 6

(3.6) If probability mass function (PMF) of a discrete random variable X is (CO3,K3) 6

X	1	2	3
f	1/2	1/3	1/6

Answer any <u>one</u> of the following-

(3.7) Explain Type I and Type II Errors with appropriate examples. (CO4,K3) 6

(3.8) A random sample of 900 members has a mean of 3.4 cm. Can it be regarded as a sample from a large population with a mean of 3.2 cm and a standard deviation of 2.3 cm? (CO4,K3) 6

Answer any <u>one</u> of the following-

(3.9) 7 men, 5 women and 8 children were given an assignment of distributing 2000 books to students in a school over a period of three days. All of them distributed books on the first day. On the second day, 1 man, 3 women and 3 children remained absent and on the third day, 4 men and 5 children remained absent. If the ratio of the number of books distributed in a day by (CO5,K3) 6

(3.10) John is the brother of Mary. Sarah is the mother of John. Michael is father of Sarah. Find relation of Michael and Mary. (CO5,K3) 6

SECTION – C 50

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

(4.1) The following data give the experience of machine operators and their performance rating as given by the number of good parts turned out per 100 pieces. 10

Operators	1	2	3	4	5	6
Performance rating (x)	23	43	53	63	73	83
Experience (y)	5	6	7	8	9	10

Calculate the regression line of performance rating on experience and also estimate the probable performance if an operator has 11 years of experience. (CO1,K3)

(4.2) If $\theta$is the acute angle between the two regression lines of variables $x$and y, show that 10

$$\tan\theta = \frac{(1-r^2)\,\sigma_x\sigma_y}{r(\sigma_x^2+\sigma_y^2)}$$

where r is the correlation coefficient and σ_x, σ_y are the standard deviations of x and y respectively. Also, discuss the significance of the result when: (i) $r = 0$ (ii) $r = \pm 1$. (CO1,K3)

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

(5.1) A continuous random variable has the probability density function 10

$$f(x) = \begin{cases} kxe^{-\lambda x}, & x \geq 0,\ \lambda > 0 \\ 0 \quad , & otherwise \end{cases}$$

Determine (i) k, (ii) mean, and (iii) variance. (CO2,K3)

(5.2) If the probability that an individual suffers a bad reaction from a certain injection is 0.001, determine the probability that out of 2000 individuals (a) exactly 3, (b) more than 2 individuals, (c) None, (d) More than one individual, will suffer a bad reaction. (CO2,K3) 10

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

(6.1) Define Binomial distribution and indicate its chief characteristics? Under what conditions does it tend to Poisson distribution? Derive the Moment Generating Function (MGF) for a Binomial distribution. Use this MGF to determine the Mean and Variance of the distribution. (CO3,K3) 10

(6.2) (i) State the probability density function (pdf) of a Normal Distribution. Explain the significance of the "Standard Normal Variate" (Z) and describe the chief characteristics of the Normal Curve.
(ii) The marks obtained by students in a competitive examination follow a Normal Distribution with a mean of 65 and a standard deviation of 10. If 1,000 students appeared for the exam then what will be the number of students who scored more than 75 marks? (CO3,K3) 10

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

(7.1) Fit a Poisson distribution to the following data and test the goodness of fit. 10

x	0	1	2	3	4
f	109	65	22	3	1

Given tabulated value at 5% of level of significance 5.991. (CO4,K3)

(7.2) Pumpkins were grown under two experimental conditions. Two random samples of 11 and 9 pumpkins show the sample standard deviations of their weights as 0.8 and 0.5 respectively. Assuming that the weight distributions are normal, test the hypothesis that the true variances are equal against the alternative that they are not, at the 10% level (Assume that $P(F_{10,8} \geq 3.35) = 0.05$ and $P(F_{8,10} \geq 3.07) = 0.05$). (CO4,K3) 10

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

(8.1) (i) Ten years hence, the respective ratio between Simmi's age and Niti's age will be 7: 9. Two years ago, the respective ratio between Simmi's age and Niti's age was 1: 3. If Abhay is 4 years older to his sister Niti, what is Abhay's present age? (in years)
(ii) A sum of money lent out at compound interest increases in value by 50% in 5 years. A person wants to lend three different sums x, y and z for 10, 15 and 20 years respectively at the above rate in such a way that he gets back equal sums at the end of their respective periods. The what will be the ratio x: y: z? (CO5,K3) 10

(8.2) (i) A T.V. set is available for Rs. 19650 cash payment or for Rs. 3100 cash down payment and three equal annual instalments. If the shopkeeper charges interest at the rate of 10% per annum compounded annually, calculate the amount of each instalment.
(ii) A, B and C enter into partnership with capitals of Rs. 25000, Rs. 30000 and Rs. 15000 respectively. A is the working partner and he gets 30% of the profit for managing the business. The balance profit is distributed in proportion to the capital investment. At the year-end, A gets Rs. 200 more than B and C together. Find the total profit and the share of each. (CO5,K3) 10