Printed Page:- 05 **Subject Code**:- **AAS0303**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: III - CARRY OVER THEORY EXAMINATION - AUGUST 2023

Subject: Statistics and Probability

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. The empirical formula for mean, mode and median is (CO1) 1

(a) $\text{Mode} = 3\,\text{Median} - 2\,\text{Mean}$

(b) $\text{Mean} = 3\,\text{Median} - 2\,\text{Mode}$

(c) $\text{Median} = 3\,\text{Mode} - 2\,\text{Mean}$

(d) None of these

1-b. The first moment about mean for any distribution is (CO1) 1

(a) 0

(b) 1

(c) 2

(d) 3

1-c. A random variable assuming only a finite number of values is called (CO2) 1

(a) Discrete random variable

(b) Continuous random variable

(c) Random variable

(d) None of these

1-d. If the probability distribution is 1

X	0	1	2	3	4
P(X)	0.5	k	-1	3k	k

of a random variable X, then k=____. (CO2)

(a) 0.1

(b) 0.2

(c) 1

(d) 0.3

1-e. In a Binomial Distribution, if 'n' is the number of trials and 'p' is the probability of success, then the mean value is given by-(CO3) 1

(a) np

(b) n

(c) p

(d) np(1-p)

1-f. If 'm' is the mean of Poisson Distribution, the P(0) is given by _____ (CO3) 1

(a) e^{-m}

(b) e^{m}

(c) e

(d) m^{-e}

1-g. 99% confidence interval of population mean are (CO4) 1

(a) $(\bar{x} - 2.58\,S.E.\,, \bar{x} + 2.58S.E.)$

(b) $(\bar{x} - 1.96S.E.\,, \bar{x} + 1.96S.E.)$

(c) $(\bar{x} - 1.645S.E.\,, \bar{x} + 1.645S.E.)$

(d) None of these

1-h. The standard error of mean of a large random sample of size n from a population with Standard deviation σ is (CO4) 1

(a) $\sigma\sqrt{n}$

(b) $\sigma/\sqrt{n}$

(c) $\sqrt{\sigma/n}$

(d) $\sigma\, n$

1-i. X, Y and Z complete a work in 6 days. X or Y alone can do the same work in 16 days. In how many days Z alone can finish the same work? (CO5) 1

(a) 12

(b) 16

(c) 24

(d) None of these

1-j. A train passes two bridges of lengths 500 m and 250 m in 100 seconds and 60 seconds respectively. The length of the train is (CO5) 1

(a) 152 m

(b) 125 m

(c) 250 m

(d) None of these

2. Attempt all parts:-

2a. Six cards are drawn at random from a pack of 52 cards. What is the probability that there will be 3 red and 3 black cards? (CO2) 2

2.b. Write down the formula for first four Moments about mean. (CO1) 2

2.c. Find the mean of Poisson distribution. (CO3) 2

2.d. What is the meaning of 'Test-statistic' in statistical hypothesis? (CO4) 2

2.e. At what time between 2 and 3 o'clock will the hands of a clock be together? (CO5) 2

SECTION B **30**

3. Answer any <u>five</u> of the following:-

3-a. Find the missing frequency from the following data: 6

Marks	:	0-10	10-20	20-30	30-40	40-50	50-60
No. of Students	:	5	15	20	?	20	10

The arithmetic mean is 34 marks. (CO1)

3-b. Calculate the mean deviation from median (CO1) 6

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	5	8	12	15	20	14	12	6

3-c. A random variable has the following probability mass function: (CO2) 6

x	0	1	2	3	4	5	6	7
f(x)	0	k	2k	2k	3k	k^2	$2k^2$	$k+7k^2$

I. Find k

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

III. If $P(X\leq a)>1/2$ find the minimum value of a.

3-d. State the theorem of additional probability. A bag contains 7 white, 6 red and 5 black balls . Two balls are drawn at random. Find the probability that they will both be white. (CO2) 6

3.e. Write short note on (CO3) 6

I. Binomial distribution

II. Poisson distribution

3.f. Fit a Poisson distribution to the following data and best the goodness of fit (CO4) 6

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

Given tabulated value of Chi-square for 2 d.f. at 5% level of significance is 5.991.

3.g. It is between 3 P.M. and 4 P.M. and the distance between the hour and the minute hand of clock is 18 minute spaces. What time does the clock show? (CO5) 6

SECTION C **50**

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

4-a. 10 competitors in a beauty contest are ranked by three judges in the following Order: 10

I Judge : 2 7 5 4 8 1 9 6 10 3

II Judge : 5 7 2 9 4 6 8 1 3 10

III Judge: 9 2 5 4 8 10 7 1 6 3

Use the rank correlation coefficient to determine which pair of judges has nearest approach to common thinking in beauty. (CO1)

4-b. Calculate the Karl Pearson's coefficient of Skewness (CO1) 10

Wages(in Rs.)	70-80	80-90	90-100	100-110	110-120	120-130	130-140	140-150
No. of workers	12	18	35	42	50	45	20	8

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

5-a. A can hit a target 4 times in 5 shots; B 3 times in 4 shots; C twice in 3 shots. They fire a volley. What is the probability that at least two shots hit? (CO2) 10

5-b. State and proof Baye's theorem and write short notes on (CO2) 10
i) Conditional probability
ii) Mutually exclusive events

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

6-a. In 800 families with 5 children each, 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. (Assume probabilities for boys and girls to be equal) (CO3)

6-b. If the probability of a blade being defective is 0.0002, then find the probability that i) One blade is defective, ii) Two blades are defective, among 100 blades using poisson distribution. (CO3) 10

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

7-a. Find the maximum likelihood estimate for the parameter λ of a Poisson distribution on the basis of a sample of size n. Also find its variance. (CO4) 10

7-b. Distinguish between the followings with examples 10
(i) Null Hypothesis and alternate Hypothesis
(ii) Type I error and Type II error. (CO4)

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

8-a. **(i)** X and Y can do a piece of work in 20 days and 12 days respectively. X started the work alone and then after 4 days Y joined him till the completion of the work. How long did the work last? 10
(ii) A man and a boy can do a piece of work in 24 days. If the man works alone for the last 6 days, it is completed in 26 days. How long would the boy take to do it alone? (CO5)

8-b. **(i)** A car takes 15 minutes less to cover a distance of 75 km, if it increases its speed by 10 km/hr from its usual speed. How much time would it take to cover a distance of 300 km using this speed? 10
(ii) Two men starting from the same place walk at the rate of 5 kmph and 5.5 kmph respectively. What time will they take to be 8.5 km apart, if they walk in the same direction? (CO5)