Printed Page:- 06 **Subject Code:- BAS0303**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: III - THEORY EXAMINATION (2024- 2025)

Subject: Statistics & 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. Wheat crops badly damaged on account of rains is: (CO1, K2) 1

(a) Cyclical movement

(b) Random movement

(c) Secular trend

(d) Seasonal movement

1-b. Let the average of three numbers be 16. If two of the numbers are 8 and 12, then the remaining number is..... (CO1, K3) 1

(a) 28

(b) 18

(c) 12

(d) 30

1-c. One card is drawn from a standard pack of 52 plying cards. Find the probability that it is either a king or a queen. (CO2, K3) 1

(a) $\frac{1}{13}$

(b) $\frac{2}{13}$

(c) $\frac{3}{13}$

(d) None of these

1-d. If two events A and B are mutually exclusive, then the probability P(A∩ B) is: (CO2, K2) 1

(a) 0
(b) 1
(c) P(A).P(B)
(d) None of these

1-e. 1

In binomial distribution probability of success in each trial remains _____.(CO3. K1)

(a) 0
(b) 1
(c) Constant
(d) Not defined

1-f. In Normal Distribution, Mean deviation about mean is (CO3, K1) 1

(a) σ
(b) $2\sigma/5$
(c) $4\sigma/5$
(d) $6\sigma/7$

1-g. 1

The area of critical region depends on the size of.... (CO4, K1)

(a) Type I error
(b) Type II error
(c) Test statistics
(d) Sample

1-h. In conducting one way analysis of variance --- test statistics would be used. (CO4,K1) 1

(a) Z
(b) T
(c) Chi-Square
(d) F

1-i. If $A=\{1,4,6\}, B=\{3,6\}$ and $C=\{3,4,6\}$ then $A \cap (B \cap C)$ is…. (CO5,K3) 1

(a) $\{3,4,5,6\}$

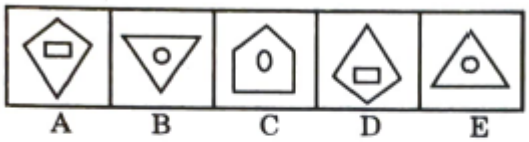
(b) $\{4,6\}$

(c) $\{1,4,6\}$

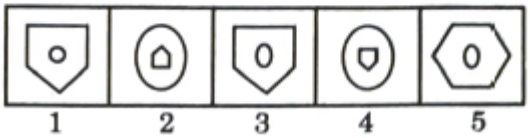
(d) $\{6\}$

1-j. Select a figure from amongst the answer figure which will continue the same series as stablished by the five-figure problem. (CO5,K2) 1

Problem Figure



Answer Figure



(a) 1

(b) 2

(c) 3

(d) 5

2. Attempt all parts:-

2.a. Prove that if two variables are independent, their correlation is zero but vice versa is not true. (CO1,K2) 2

2.b. Find the probability of getting 53 Sundays in a leap year. (CO2,K3) 2

2.c. A Binomial random variable X satisfies the relation 9P(X=4) =P(X=2) ,When n=6 . Find value of P(X=1) . (CO3, K3) 2

2.d. Define an estimator in statistics. (CO4, K1) 2

2.e. Check whether the function $f : N \rightarrow N$ is defined by $f(x)=x^2+12$ is one-one or not.(CO5, K3) 2

SECTION-B 30

3. Answer any five of the following:-

3-a. The mean and standard deviation of the marks of 100 candidates was found to be 40 and 5.1, respectively. Later, it was discovered that a score of 40 was wrongly read as 50. Find out the correct mean and standard deviation respectively. (CO1,K3) 6

3-b. Calculate Spearman's rank correlation coefficient from the following data: (CO1, K3) 6

X	68	64	75	50	64	80	75	40	55	64
Y	62	58	68	45	81	60	68	48	50	70

3-c. A random variable X has the following distribution, Find the value of K. Also find Mean and variance (CO2, K3) 6

x	-2	-1	0	1	2	3
P(x)	0.1	K	0.2	2K	0.3	K

3-d. A bag X contains 2 white and 3 red balls and another bag Y contains 4 white and 5 red balls. One ball is drawn at random from one of the bags and is found to be red. Find the probability that it was drawn from bag Y. (CO2, K3) 6

3.e. If 10% of the bolts produced by a machine are defective, determine the probability that out of 10 bolts choosen at random 6
i) 1
ii) None
iii) at most 2 bolts will be defective. (CO3,K3)

3.f. 6

A sample of 20 items has mean 42 units and S.D. 5 units. Test the hypothesis that it is a random sample from a normal population with mean 45 units. (If the tabular value at 5% LOS for 19 d. f. is 2.09). (CO4, K3)

3.g. How many different words can be formed using all the letters of the world ALLAHABAD 6

1. *When the vowels occupy the even position.*
2. Both L do not occur together. (CO5,K3)

SECTION-C 50

4. Answer any one of the following:-

4-a. In a partially destroyed laboratory record of analysis of a correlation data, the following results only are legible: (CO1,K3) 10
Variance of x = 9; Regression equations: *8x – 10y + 66=0, 40x – 18y = 214.*
What were (a) the mean values of x and y (b) the standard deviation of y (c) the coefficient correlation between x and y.

4-b. Fit a second degree parabola by the method of least squares to the following data . (CO1, K3) 10

X	0	1	2	3	4
Y	1	4	10	17	30

5. Answer any one of the following:-

5-a. State and prove Bayes theorem. 10
In a Neighbourhood, 90% children were falling sick due flu and 10% due to measles and no other disease. The probability of observing rashes for measles is 0.95 and for flu is 0.08. If a child develops rashes, find the child's probability of having flu. (CO2, K3)

5-b. Let the two dimensional continuous random variable(X,Y) has joint PDF given by 10

$$f(x,y) = \begin{cases} 6x^2y\ , & 0 < x < 1,\ 0 < y < 1 \\ 0 \quad , & \text{elsewhere} \end{cases}$$

Find (i) P(0<x<3/4 , 1/3<y<2) (ii) P(x + y <1). (CO2, K3)

6. Answer any one of the following:-

6-a. A manufacturer of envelopes knowns that the weight of the envelopes is normally distributed with mean 1.9gm and variance 0.01 square gm. Find how many envelopes weighing (i)2gm or more 10
(ii)2.1gm or more, can be expected in a given packet of 1000envelopes?
Given that the area under the standard curve
between $z = 0$ and $z = 1$ is 0.3413,

between $z = 0$ and $z = 2$ is 0.4772. (CO3,K3)

6-b. 10

Four coins were tossed 200 times. The number of tosses showing 0,1,2,3 and 4 heads were found to be as under.
Fit a binomial distribution to these observed results. Find the expected frequencies. (CO3, K3)

No. of Heads	0	1	2	3	4
No. of Tosses	15	35	90	40	20

7. Answer any one of the following:-

7-a. 10

To test of significance of the variations of the retail prices in the commodity in three principal cities: Mumbai, Bangalore and Chennai. The four shops were chosen at random in each city and prices observed in INR were as follows:

Mumbai	16	8	12	14
Bangalore	14	10	10	6
Chennai	4	10	8	8

Do the data indicate that the prices in the three cities are significantly different? Given that the tabular value of F is 4.26 5% LOS with d.f. is (2,9). (CO4,K3)

7-b. From the following data, find whether hair color and gender are associated. 10

Gender↓	*Colour*					
	Fair	**Red**	**Medium**	**Dark**	**Black**	**Total**
Boys	529	849	504	119	36	2100
Girls	544	677	451	97	14	1783
Total	1136	1526	955	216	50	3883

Given that the tabular value of $\chi 2$ is 9.488 at 5%LOS with d.f. 4. (CO4, K3)

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

8-a. Solve the following: (CO5,K3) 10

1. What is the sum of all five-digit numbers formed by 2, 3, 4, 5, 6 without repetition?
2. What is the sum of all five-digit numbers formed by 2, 3, 4, 5, 6 with repetition?

8-b. Study the following table and answer the questions based on it 10

Expenditures of a Company (in Lakh Rupees) per Annum Over the given Years.

Year	**Item of Expenditure**				
	Salary	**Fuel and Transport**	**Bonus**	**Interest on Loans**	**Taxes**
1998	288	98	3	23.4	83
1999	342	112	2.52	32.5	108
2000	324	101	3.84	41.6	74
2001	336	133	3.68	36.4	88
2002	420	142	3.96	49.4	98

i) Find the average amount of interest per year which the company had to pay during this period?

ii) The total amount of bonus paid by the company during the given period is approximately what percent of the total amount of salary paid during this period?
iii) Total expenditure on all these items in 1998 was approximately what percent of the total expenditure in 2002?
iv) The total expenditure of the company over these items during the year 2000 is?
v) The ratio between the total expenditure on Taxes for all the years and the total expenditure on Fuel and Transport for all the years respectively is approximately? (CO5,K3)