

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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:-

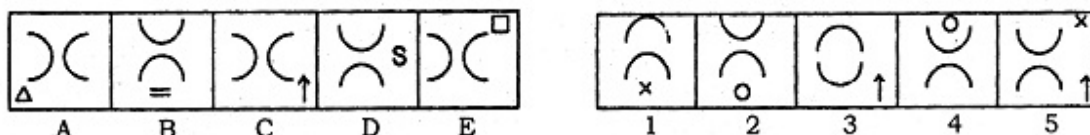
- 1-a. In time series, seasonal variations can occur within a period of: (CO1,K1) 1
- (a) Four years
- (b) Three years
- (c) One year
- (d) Nine year
- 1-b. The number of observations is 30 and the value of arithmetic mean is 15. Then the sum of all the observations is _____. (CO1, K3) 1
- (a) 15
- (b) 450
- (c) 200
- (d) 45
- 1-c. If the probability density function $f(x) = cx^2$, $0 \leq x \leq 1$, then the value of c is: (CO2, K3) 1
- (a) 2
- (b) 3
- (c) 1
- (d) None of these
- 1-d. If x is a random variable and a & b are constants then $\text{Var}(ax+b)$ is equal to: (CO2, K2) 1

- (a) $a \cdot \text{Var}(x)$
- (b) $a^2 \text{Var}(x)$
- (c) $a \cdot \text{Var}(ax)$
- (d) $a^2 \cdot \text{Var}(ax)$

- 1-e. In Standard normal distribution, the value of mode is _____(CO3, K1)
- (a) 2
 - (b) 1
 - (c) 0
 - (d) Not fixed
- 1-f. A mobile conversation follows as an exponential distribution with probability density function $f(x) = \frac{1}{3} e^{-\frac{x}{3}}$. then probability that the conversation takes more than 5 minutes is..... (CO3, K3)
- (a) $e^{-5/3}$
 - (b) $e^{5/3}$
 - (c) $5e^{-15}$
 - (d) None of these
- 1-g. Ahypothesis which is tested for the purpose of rejection under the assumption that it is true (CO4, K1)
- (a) Null Hypothesis
 - (b) Alternate hypothesis
 - (c) Arbitrary Hypothesis
 - (d) Composite hypothesis
- 1-h. In One-way ANOVA, the null hypothesis (H_0) is generally testing that(CO4, K1)
- (a) There is significant difference between group means.
 - (b) There is no significant relationship between variables.
 - (c) There is no significant difference between group means.
 - (d) The data is normally distributed.
- 1-i. The number of elements in the Power set $P(S)$ of the set $S = \{1, 2, 3\}$ is (CO5, K3)
- (a) 4
 - (b) 3
 - (c) 8
 - (d) None of these

1-j. The next of E is... (CO5, K2)

1



- (a) 1
- (b) 2
- (c) 3, 5 both
- (d) 4

2. Attempt all parts:-

- 2.a. If Karl Pearson's coefficient of skewness of a distribution is 0.32, its standard deviation is 6.5 and mean is 29.6. Find the mode of the distribution. (CO1, K3) 2
- 2.b. For two events A and B, given that $P(A) = 0.4$, $P(B) = k$ and $P(A \cup B) = 0.6$ Find the value of k such that events A and B are mutually exclusive. (CO2, K3) 2
- 2.c. A die is tossed thrice. A success is getting 1 or 6 on a toss. Find the mean and variance of no. of success. (CO3, K3) 2
- 2.d. Define level of significance. (CO4, K1) 2
- 2.e. Find the least number which when divided by 4, 6, 8, 12 and 16 leaves a remainder of 2 in each case. (CO5, K3) 2

SECTION-B

30

3. Answer any five of the following:-

- 3-a. In the frequency distribution of 100 families given below, the number of families corresponding to expenditure groups (20-40) and (60-80) are missing from the table. However, the median is known to be 50. Find the missing frequencies. (CO1, K3) 6

Expenditure	0-20	20-40	40-60	60-80	80-100
No. of families	14	?	27	?	15

- 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 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, K3) 6
- 3-d. State and prove addition law of probability. (CO2, K2) 6
- 3.e. 6

A student is given a true false examination with 8 questions. If he corrects at least seven questions, he passes the examination. Find the probability that he will pass the given that he guesses all questions. (CO3, K3)

- 3.f. The average income of persons was Rs 210 with S.D. of Rs 10 in a sample of 100 people of a city. For another sample of 150 persons, the average income was Rs 220 with S.D. of Rs 12. The S.D. of income of the people of the city was Rs 11. Test whether there is any significant difference between the average incomes of the localities. If the tabulated value is 1.96 at 5% level of significance. (CO4, K3) 6
- 3.g. Statements: All men are vertebrates. Some mammals are vertebrates. 6
 Conclusions:
 All men are mammals.
 All mammals are men.
 Some vertebrates are mammals.
 All vertebrates are men.
 Justify your answer. (CO5, K2)

SECTION-C

50

4. Answer any one of the following:-

- 4-a. Fit a straight line trend for the following data by the method of least squares: 10
 (CO1, K3)

Year	2009	2010	2011	2012	2013
Production(in tonnes)	12	20	28	32	50

 Also find the trend values.

- 4-b. If $\sigma_x^2 = 4$ and Regression equations: $2Y - X = 50$ and $3Y - 2X = 10$. 10
 (CO1, K3)
 Find (i) the mean values of x and y (ii) the standard deviation of y, (iii) coefficient of correlation between x and y.

5. Answer any one of the following:-

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

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

 Find (i) $P(0 < x < 3/4, 1/3 < y < 2)$ (ii) $P(x + y < 1)$. (CO2, K3)
- 5-b. An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probabilities of accident are 0.01, 0.03 and 0.15 respectively. If one of the insured person meets an accident. then find the probability that he is a scoter driver. (CO2, K3) 10

6. Answer any one of the following:-

- 6-a. In a certain factory turning out razor blades, there is small chance of 0.002 for any blade to be defective. the blades are supplied in a packets of 10. Calculate approximate no. of packets containing : (CO3, K3) 10
 i) No defective
 ii) one defective
 iii) two defectives
 Assume in a consignment of 10000 packets.

- 6-b. In a sample of 1000 cases, the mean of a certain test is 14 and S.D. is 2.5. Assuming the distribution to be normal, find (i) how many students score between 12 and 15? (ii) how many score above 18? (iii) how many score below 8? (iv) how many score 16? Given that the area under the standard curve between **between $z = 0$ and $z = 0.8$ is 0.2881,**
between $z = 0$ and $z = 0.4$ is 0.1554,
between $z = 0$ and $z = 1.6$ is 0.4452,
between $z = 0$ and $z = 2.4$ is 0.4918,
between $z = 0$ and $z = 0.6$ is 0.2257,
between $z = 0$ and $z = 1$ is 0.3413. (CO3, K3)

7. Answer any one of the following:-

- 7-a. It is desired to compare three Hospitals with regards to number of deaths per month. A sample of death records of each hospital and the number of deaths was given below. From these data suggest a difference in the no. of the deaths per month among three hospitals. 10

A	B	C
3	6	7
4	3	3
3	3	4
5	4	6
0	4	5

The tabular value of F at 5 % level of significance with degree of freedom $v_1 = 2$ and $v_2 = 12$ is 3.89.

- 7-b. Fit the Poisson distribution and test the goodness of fit at 5% level of significance: 10

X	0	1	2	3	4
F	419	352	154	56	19

Tabulated value: 7.815 (CO4, K3)

8. Answer any one of the following:-

- 8-a. Calculate the maximum power of 3 in the expansion of $1! \times 2! \times 3! \times \dots \times 100!$. 10
 (CO5, K3)
- 8-b. Calculate how many different words can be formed by using all the letters of the word, 'ALLAHABAD'. (CO5, K3) 10
 In how many of them :
 (ii) Both L's do not come together ?
 (iii) The vowels occupy the even positions ?

(CO4,K3)

COP:JULY_DEC-2024