

QP Code : 25261

(3 Hours)

Total Marks: - 80

N.B.

1. Question no.1 is compulsory.
2. Attempt any four questions from the remaining six questions.
3. Assume any necessary data but justify the same
4. Figures to the right indicate full marks
5. Use of scientific calculator is allowed

- 1 (a) (i) If the letters of the word "LOGARITHM" are arranged at random, find the probability that the arrangement starts and ends with vowels (5)
- (ii) Find the mean and variance of Binomial Distribution (5)
- (b) (i) Calculate Spearman's rank correlation coefficient from the following data: (5)

Rank x	2	10	9	8	7	5	4	6	1	3
Rank y	7	8	10	2	4	5	6	9	3	1

- (ii) A coin is tossed 3 times. Calculate the expected value of the number of heads obtained (5)
- 2 (a) (i) The mean and standard deviation of 100 items are 40 and 10. If at the time of calculation two items are wrongly taken as 30 and 72 instead of 3 and 27, find the correct mean and standard deviation. (4)
- (ii) X is normally distributed and the mean of X is 12 and standard deviation is 4. Find (4)
- $P(X \geq 20)$
 - $P(0 < X < 12)$
- Given $P(0 < x < 2) = 0.4772$ & $P(0 < x < 3) = 0.4987$
- (b) If X and Y are two random variables having joint density function (7)
- $$f(x,y) = 2 \quad ; \quad 0 < x < 1, 0 < y < x$$
- $$= 0 \quad ; \quad \text{otherwise}$$
- (i) Find the marginal density functions of X and Y
 - (ii) Find conditional density function of Y given X and X given Y
 - (iii) Check for independence of X and Y
- 3 (a) (i) A certain drug administered to 12 patients resulted in the following change in their blood pressure: 5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0, 4 (4)
- Can we conclude that the drug increases in blood pressure? (t value for 5% level of significance and 11 degrees of freedom is 2.201)

- 3 (a) (ii) Find the coefficient of variation for the following (4)

Age in years	20-25	25-30	30-35	35-40	40-45	45-50
Number of policyholders	2	7	5	2	4	5

- 3 (b) What is Sample Space? What are mutually likely events and Independent events? (7)

A box contains 36 tags numbered 1 to 36. One tag is drawn at random. Find the probability that the number on the tag is either divisible by 3 or is a perfect square

- 4 (a) (i) Prove using laws of expectation: (4)

- $E(aX+b) = aE(X) + b$
- $V(aX+b) = a^2V(X)$

- 4 (a) (ii) Sample survey was taken to check which newspaper (A, B, C) people read. In a sample of 100 people, the following results were obtained. 60 read A, 40 read B, 70 read C, 45 read A and C, 32 read A and B, 38 read B and C, 30 read A, B and C. If a person is selected at random, find the probability that he reads at least two newspapers. Also find the probability that he does not read any paper (4)

- 4 (b) Calculate Bowley's coefficient of skewness for the following distribution. (7)

Class	05-10	10-15	15-20	20-25	25-30	30-35	35-40
Frequency	07	09	16	22	14	12	3

- 5 (a) (i) Calculate the mean deviation about the mean for the following data (4)

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	12	8	5	10	7	3	2

- 5 (a) (ii) The number of hardware failures in a week of operation has the following data (4)

Number of Failures	0	1	2	3	4	5	6
Probability	0.18	0.28	0.25	0.18	0.06	0.04	0.01

Find the expectation and variance of the number of failures

- 5 (b) Prove with an example that three events may be mutually independent but need not be pairwise independent (7)

- 6 (a) (i) The following figures show the distribution of digits in numbers chosen at random from a telephone directory: (4)

Digits	0	1	2	3	4	5	6	7	8	9
Frequency	1026	1107	997	966	1075	933	1107	972	964	853

Test if the digits may be taken to occur equally frequently in the directory. (Chi Square value at 5% level of significance at 9 degrees of freedom is 16.919)

- 6 (b) (ii) Find the mode for the following distribution (4)

Class Interval	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	5	8	7	12	28	20	10	10

- 6 (b) (iii) State and prove Baye's theorem. The chances that doctor A will diagnose a disease X correctly is 60%. The chances that a patient will die by his treatment after correct diagnosis is 40% and the chance of death by wrong diagnosis is 70%. A patient of doctor A, who had disease X, died. What is the chance that his disease was diagnosed correctly? (7)

- 7 (a) (i) Prove the memoryless property of Geometric Distribution (4)

- 7 (a) (ii) An urn contains 6 white, 4 red and 9 black balls. If 3 balls are drawn at random, find the probability that (4)
- Two of the balls drawn are white
 - One is of each color.
 - None is red
 - At least one is white

- 7 (b) (iii) The ages of husbands and wives in seven couples were as follows (7)

Age of Husband	45	44	50	53	66	30	48
Age of Wife	42	40	41	42	56	30	43

Find Karl Pearson's coefficient of correlation