

(3 Hours)

Total Marks: 80

N.B (1) Question No.1 is compulsory.

(2) Attempt any three questions out of remaining five questions.

(3) Assume necessary data but justify the same

(4) Figures to the right in parenthesis indicate full marks

(5) Use of scientific calculator is allowed

1. (a) Find the median of the following distribution: (5)

Wages(in Rs)	2000-3000	3000-4000	4000-5000	5000-6000	6000-7000
Number of workers	3	5	20	10	5

(b) Find quartile deviation for the following data: (5)

Marks	Number of students
0-10	6
10-20	5
20-30	8
30-40	15
40-50	7
50-60	6
60-70	3

(c) 10 balls are distributed at random among 4 boxes. What is the probability that the first box will contain 4 balls? (5)

(d) In 4 tosses of a coin, let X denote number of heads. Find the expectation of X and variance of X. (5)

2. (a) The joint distribution function of a two dimensional random variable(x,y) is given as: (10)

$$F(x,y) = 1 - e^{-x} - e^{-y} + e^{-(x+y)}; \quad x > 0, y > 0$$

$$= 0; \quad \text{elsewhere}$$

- Find the marginal density functions of x and y
- Are x and y independent?
- $P(X \leq 1 \cap Y \leq 1)$

(b) Draw an ogive for the following data (5)

Class Intervals	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	30	15	27	45	36	31	17

(c) Find the equation of line of regression y on x, line of regression x on y and estimate the probable value of y when x=8 (5)

X	3	4	5	6	4	5	6	7
Y	3	5	3	2	3	4	6	6

3. (a) Obtain the rank correlation coefficient for the following: (10)

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

- (b) Prove with an example that 3 events might be pairwise independent but need not be mutually independent (5)
- (c) Prove $E(aX + b) = aE(X) + b$ where X denotes a continuous random variable (5)
4. (a) State and prove Baye's Theorem. The probabilities of X, Y and Z becoming managers are $\frac{4}{9}$, $\frac{2}{9}$ and $\frac{1}{3}$ respectively. The probabilities that the bonus schemes will be introduced if X, Y and Z becomes managers are $\frac{3}{10}$, $\frac{1}{2}$ and $\frac{4}{5}$ respectively. (10)

- What is the probability that the bonus scheme will be introduced?
- If the bonus scheme has been introduced, what is the probability that the manager appointed was X?

- (b) Find if A and B are independent, positively associated or negatively associated: (5)
 $N=1000$, $(A)=470$, $(B)=620$ and $(AB)=320$

- (c) The following figures shows the distribution of digits in numbers chosen at random from a telephone directory: (5)

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

Test if the digits may be taken to occur frequently in the directory.
 Tabulated Chi Square value is 16.919

5. (a) Calculate Bowley's coefficient of skewness for the following frequency distribution (10)

Marks	0-10	10-20	20-30	30-40	40-50
Students	5	7	20	12	6

- (b) Find the mode for the following distribution (5)

Wages	70-80	80-90	90-100	100-110	110-120	120-130	130-140
Frequency	85	109	126	134	115	83	68

- (c) 25 books are placed at random in a shelf. Find the probability that a particular pair of books shall be always together (5)

6. (a) A group of 100 items has a mean 60 and variance 25. If the mean of 50 of these items is 61 and standard deviation is 4.5, find the mean and standard deviation of the remaining 50 items (5)

- (b) x is a continuous random variable with the function: (5)
 $f(x) = 6x(1-x)$, $0 < x < 1$

Check if f(x) is a probability density function

- (c) A mechanist is making engine parts with axle diameters of 0.700 inch. A random sample of 10 parts shows a mean diameter of 0.742 inch with a (5)

standard deviation of 0.040 inch. Test if the work is meeting the specifications. Tabulated value of t is 2.262

- (d) In a series of houses actually invaded by smallpox, 70% of the inhabitants are attacked and 85% have been vaccinated. What is the lowest percentage of the vaccinated that must have been attacked? (5)