

7. (a) Define regression coefficients in detail. Show that correlation coefficient is the geometric mean between regression coefficients.
- (b) Explain Principle of Least Squares to fit exponential curve $Y = a b^X$. (7,8)

(1000)

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1556

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Unique Paper Code : 2372571103

Name of the Paper : Descriptive Statistics and Probability Theory

Name of the Course : B.A. (P) / B.Sc. (P) under NEP-UGC (Admission in 2023)

Semester : I

Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Question No. 1 is compulsory.
3. Attempt any five questions from the remaining questions.
4. All questions carry equal marks.
5. Use of simple calculator is allowed.

P.T.O.

1. (a) Answer the followings :

(i) Formula of coefficient of variation is _____ .

(ii) In mesokurtic distribution, $\beta_2 =$ _____ .

(iii) Which average can be located using ogive?

(iv) If $Q_1 = 10$ and $Q_3 = 40$, then semi-interquartile range is _____ .

(v) Harmonic mean becomes zero when one of the items is zero. Is the statement True?
(1×5=5)

(b) Distinguish between grouped and ungrouped frequency distributions with suitable examples.

(c) Find the mean deviation from the mean of A.P. series $a, a+d, a+2d, \dots, a+(2n)d$.

(d) Find the variance of first 10 natural numbers.

(c) Define Kurtosis. Explain it with the help of a figure. Show that for a discrete distribution, Pearson's coefficient $\beta_2 > 1$. (4,4,7)

6. (a) Define Spearman's rank correlation coefficient. Prove that Spearman's rank correlation coefficient (ρ) is given by :

$$\rho = 1 - \frac{6 \sum_{i=1}^n d_i^2}{n(n^2-1)},$$

where d_i denotes the difference between the ranks of i -th individual.

(b) Show that if X', Y' are the deviations of the random variables X and Y from their respective

means, then $r = -1 + \frac{1}{2N} \sum_i \left(\frac{X'_i}{\sigma_X} + \frac{Y'_i}{\sigma_Y} \right)^2$. (8,7)

(4 white, 5 black & 3 red balls). One urn is chosen at random and two balls drawn from it. They happen to be white and black. What is the probability that they come from Urn II & III?

(8,7)

5. (a) Let A and B be the two possible outcomes of an experiment and suppose $P(A) = 0.4$, $P(A \cup B) = 0.7$ and $P(B) = p$. Then

(i) For what choice of p, A and B are mutually exclusive?

(ii) For what choice of p, A and B are independent?

- (b) Pearson's coefficient of skewness for a distribution is 0.4 and its coefficient of variation is 30%. Its mode is 88, find mean and median. Comment upon the symmetry of distribution.

- (e) A frequency distribution has $CV=5$, Karl Pearson's coefficient of skewness $=0.5$, $\sigma=2$. Find the mean and mode of the distribution.

- (f) Illustrate exclusive and inclusive class intervals. Also, explain how inclusive classes are converted into exclusive classes. $(2 \times 5 = 10)$

2. (a) The following table gives the age distribution of a group of 50 individuals.

Age (in years)	16-20	21-25	26-30	31-36
No. of persons	10	15	17	8

Calculate range and the coefficient of range.

- (b) Find the missing frequency from the following distribution of daily sales of shops, given that the median sale of Rs. 2,400.

1556

4

Sale in hundred Rs	0-10	10-20	20-30	30-40	40-50
No. of shops	5	25	?	18	7

- (c) Describe how you can represent a frequency distribution diagrammatically using cumulative frequencies. Following is the distribution of marks in law obtained by 50 students :

Marks (more than)	0	10	20	30	40	50
No. of students	50	46	40	20	10	3

Calculate the median marks graphically.

(3,4,8)

3. (a) The arithmetic mean and standard deviation of series of 20 items were calculated by a student as 40 cm and 25 cm respectively. However, while calculating an item 12 was misread as 21. Calculate the corrected arithmetic mean and standard deviation.

1556

5

- (b) A problem in statistics is given to students A and B. The odds in favour of solving the problem are 4:5 and against the problem are 6:4. If both A and B attempt, find the probability of the problem being solved.

- (c) Prove that for n events $A_1, A_2, \dots, A_n$,

$$P(\cap_{i=1}^n A_i) \geq \sum_{i=1}^n P(A_i) - (n-1). \quad (5,4,6)$$

4. (a) Explain mutual independence of n events. Prove that if A, B and C are random events in a sample space and if A, B and C are pairwise independent and B is independent of $(A \cup C)$, then A, B and C are mutually independent.

- (b) The contents of Urn I, Urn II and Urn III are respectively as follows: (1 white, 2 black & 3 red balls), (2 white, 1 black & 1 red balls) and

P.T.O.