

Time allowed: 3 Hours

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting atleast two questions from each Section

x-x-x

1. (i) Write down the probability mass function of hyper geometric distribution. (2)
- (ii) What is the relationship between mean and variance of gamma distribution? (2)
- (iii) If X and Y are independent then Karl Pearson's coefficient between X and Y is equal to zero or not? (2)
- (iv) State the weak law of large numbers. (2)
- (v) What is the relationship between partial correlation coefficient and simple correlation coefficient. (2)
- (vi) What is the difference between correlation and association? (2)
- (vii) What is the shape of exponential distribution? (1)

Section I

2. (a) Suppose $X \sim B(n, p)$ with $\mu_x = E(X) = 5$, $\sigma_x^2 = \text{Var}(X) = 4$. Find the value of n and p and $P(X < \mu_x - 3\sigma_x)$.
- (b) Determine the modes of the binomial and Poisson distributions. Show that the mode coincides with the mean np or λ is an integer. (6,7)
3. If X denotes the number of failures preceding the rth success in an infinite series of independent trials with constant probability p of success for each trial, then identify the distribution of X. Find the mean and variance of the distribution by using moment generating function (mgf). What is the distribution when $r = 1$? (13)
4. (a) Show that the mean deviation about mean of a normal distribution is $\sqrt{\frac{2}{\pi}} \times \sigma$, σ being the s.d. of the distribution.
- (b) Write down the probability density function of uniform distribution. Find moment generating function (mgf) of uniform distribution. By using mgf find the mean and variance. (5,8)
5. (a) Use Chebyshev's inequality to determine how many times a fair coin must be tossed in order that the probability will be at least 0.95 that the ratio of the number of heads to the number of tosses will be between 0.45 and 0.55.
- (b) State and prove the Lindeberg-Levy central limit theorem. (5,8)

Section II

6. Define term Correlation by giving real life example. State and prove its important properties. What are its limitations? (13)
7. (a) Find the angle between two lines of regression.
- (b) For the variable x and y, the two regression lines are $3x + 2y = 25$ and $6x + y = 30$ which one is the regression line of x on y? what are mean of x, mean of y, standard deviation of x and y and correlation coefficient? (5,8)
8. (a) Define multiple correlation and partial correlation and indicate how they differ from simple correlation.
- (b) Six boys and six girls are ranked below on the basis of their performance in a mathematics test. Do you find any association between sex and performance?

Sex	B	B	G	B	B	G	G	G	B	G	B	G
Rank	2	2	2	4	5	6.5	6.5	8	9.5	11	9.5	12

B=Boy,

G=Girl

(8,5)

9. (a) What are the various methods of finding whether two attributes are associated, dissociated or independent? Describe one such measure of association.
- (b) Given that $(AB) = 256$, $(\alpha B) = 768$, $(A\beta) = 48$, $(\alpha\beta) = 144$; check whether A and B are independent, positively associated and negatively associated. (9,4)