

Code: 8967

T.Y. B.Sc.
Statistics Paper – 301 [Mathematical Statistics]

Time: - 3 Hours

Marks: 75

- Instructions: - (1) There are FIVE compulsory questions in this question paper.
(2) All questions carry equal marks.
(3) Statistical Tables will be provided upon request.

- Q1 a) State and prove 'Chebyshev's inequality' for a continuous random variable. What does it give us? 8
b) Check whether for the sequence of random variable $\{X_k\}$, WLLN holds good or not? 7
Prob. $\{X_k = 1/\sqrt{k}\} = 2/3$ and Prob. $\{X_k = -1/\sqrt{k}\} = 1/3$.

OR

- Q1 a) State and prove the Inversion Theorem of Characteristic function. 8
b) Examine if the following sequence of random variable $\{X_k\}$, holds C.L.T. or not? 7
Prob. $\{X_k = \alpha\} = \alpha$ and Prob. $\{X_k = 1 - \alpha\} = 1 - \alpha$

- Q2 a) Define hyper geometric distribution. Show that under certain conditions to be stated, hyper geometric distribution tends to binomial distribution. 8
b) What do you understand by truncated distribution. Obtain mean and variance of left truncated Poisson distribution truncated at $X = 0$. 7

OR

- Q2 a) Define Laplace distribution. Show that the quartile deviation of Laplace distribution is $\lambda^{-1} \log_e 2$. 8
b) Derive Characteristic function of Cauchy Distribution with parameters (μ, λ) . Hence find distribution of $X_1 - X_2$. 7

OR

- Q3 a) Define bivariate normal distribution. Obtain an expression for its marginal p.d.f. of X . 7
b) (i) Derive an expression for the Variance of the residual- $\sigma_{2.1}^2$. 4
(ii) State any three properties of Residual. 4

OR

- Q3 a) Obtain an expression for conditional distribution of X given Y= y of bivariate normal distribution. 8
b) Derive an expression for Multiple correlation coefficient $R_{1.23}$. 7
- Q4 a) Define negative binomial distribution. Obtain an expression for its probability generating function. Hence find its mean and variance. 8
b) Find the probability that a person tossing 3 coins will get either all heads or all tails for the 2nd time on the 5th toss assuming independence. 7
- Q4 a) Define Geometric distribution. Obtain an expression for its m.g.f. 8
b) If the probability that a target is destroyed on any shot is 0.5, what is the probability that it would be destroyed in 6th attempt? 7
- Q5 a) Define a chi- square random variable with n- degrees of freedom. Derive its p. d. f. 7
b) If X and Y are independent chi- square random variable with n_1 and n_2 degrees of freedom respectively. Obtain the p. d. f. of $\frac{X}{X+Y}$. 8
- Q5 a) Define F- distribution . Derive the p. d. f. of Define F- distribution with (r_1, r_2) degrees of freedom. 8
b) Show that for large sample t distribution tends to Normal distribution. 7