

Oct-2015

Paper Code : 4625

B. Sc. Sem. VI [Statistics]
ST -601 [Mathematical Statistics - III]

Time : $2\frac{1}{2}$ Hours

Marks:70

Instructions:

1. There are FIVE compulsory Questions in this paper. Each question carries 14 marks.
2. Statistical tables & Graph Papers will be provided on request.
3. Use of scientific calculator is allowed.

- Q 1. a) Define a Rectangular Probability distribution over (a, b). Obtain its r^{th} raw moment. Hence find μ_1, μ_2 . 10
- b) If X has a Laplace distribution with parameters (0, 1), Find the prob. $\{ |X| < 1 \}$. 04

OR

- Q. 1. a) Prove that the sum of two independent Cauchy random variables is a Cauchy random variable. 08
- b) Suppose that you spin the dial shown in the figure so that it comes to rest at a random position. Model this with a suitable probability density function, and use it to find the probability that the dial will land somewhere between 10° and 300° . 06
- Q 2. a) Derive the p. d. f. of Fisher's t random variable with n degrees of freedom. 08
- b) If X has an F Probability distribution (n_1, n_2) d. f. Obtain the distribution of $Y = \frac{1}{X}$. 06

OR

- Q 2. a) Derive expression for m. g. f. of Laplace Probability distribution. 06
- b) Prove that the ratio of two independent standard normal random variables is a standard Cauchy random variable. 08
- Q 3. a) For a t Probability distribution with n d.f. prove that (in usual notations) 10

$$\mu_{2r} = \frac{(1)(3)\dots(2r-1)}{(n-2)(n-4)\dots(n-2r)} n^r, \text{ when } n > 2r$$

Hence find its Variance.

- b) Define Fisher's t- variable. Show that the student's t statistic is a special case of Fisher's t. 04

OR

- Q 3. a) Prove that - If X follows a t - distribution with n d.f. then $Y = X^2$ follows an F Probability distribution with (1, n) d.f. 10
b) Show that mean deviation about mean of Laplace distribution is $1/\lambda$. 04
- Q 4. a) Derive an expression for plane of regression of X_2 on X_1 and X_3 . 10
b) State and prove any properties of residual. 04

OR

- Q 4. a) What is residual of order 0, order 1 and order 2 in a regression study involving three variables? 06
b) Obtain the limiting form of t - Probability distribution. 08
- Q 5. a) Based on the multiple regression study of X_1 on X_2 and X_3 , prove that 05
$$\sigma_{1.23}^2 = \sigma_1^2 \frac{|\Delta|}{\Delta_{11}}, \text{ (in usual notations)}$$

b) In a trivial distribution, $\sigma_1 = 2$, $\sigma_2 = \sigma_3 = 3$, $r_{12} = 0.7$, $r_{23} = r_{31} = 0.5$. 09
Find, i) $r_{23.1}$, ii) $R_{1.23}$, and iii) $\sigma_{1.23}$.

OR

- Q 5. a) Explain the partial correlation coefficients. In usual notations, Derive an expression for $r_{23.1}$. 08
b) Show that, (in usual notations) 06
$$(1 - R_{1.23}^2) = (1 - r_{12}^2) (1 - r_{13.2}^2).$$