April – 2016 Paper Code : 4625

Semester VI Statistics

Paper ST – 601[Mathematical Statistics- III]

Date: / / **Time: $2\frac{1}{2}$ hours**

Marks: 70

Instructions:

1. All questions are compulsory.
2. Each question carries **14** marks.
3. Statistical tables will be provided on request.
4. Use of scientific calculator is allowed.

Q 1. a) State cumulative distribution function of a random variable X. If X has a rectangular distribution over *(m, n)*, then find variance using m.g.f. of a random variable X. 06

b) State and prove additive property of Cauchy distribution. 08

OR

Q. 1. a) If X follows uniform distribution over (0, 1), and for constants b and c, such that b < c, if Y = (c – b) X + b, then find the distribution of Y. 06

b) State the probability distribution function of double exponential distribution and derive the expression for its variance. 08

Q 2. a) State probability distribution function of Cauchy Distribution. State its properties. 07

b) Derive Snedecor's F distributions. 07

OR

Q 2. a) Describe the limiting form of t – distribution. 06

b) Derive the expression for central moments of t – distribution. 06

Q 3. a) If If X has F distribution with parameters or d.f (5, 10), then find a and b such that $P(X \leq a)=0.05$, $P(X \leq b)=0.95$ and $P(a < X < b) = 0.90$ 06

b) Given that a r. v. X follows an Snedecor's F distribution with *(m, n)* d.f. then show that $Y=\frac{1}{X}$ follows Snedecor's F distribution with *(n,m)* d.f. 08

OR

Q 3. a) If a random variable X has F distribution with df *(p,q)*, then find the mode of X. 08

b) For a t Probability distribution with 14 d.f. determine a constant b such that $P(-b < t < b) = 0.90$ 06

Q 4. a) In usual notations, derive the equation of plane of regression of X_1 on X_2 and X_3. 08

b) State and prove the properties of residuals. 06

OR

Q 4. a) Show that, (in usual notations) 05

$$(1 - R^2_{1.23}) = (1 - r^2_{12}\ ).(1 - r^2_{13.2}).$$

b) In a trivial distribution, $\sigma_1 = 2$, $\sigma_2 = \sigma_3 = 4$, $r_{12} = 0.9$, $r_{23} = r_{31} = 0.25$. 09

Find, i) $r_{23.1}$, ii) $R_{1.23}$, and iii) $\sigma_{1.23}$.

Q 5. a) Explain the Concept of Multiple & partial correlation coefficients. 06

b) In usual notations, prove that 08

$$\sigma^2_{1.23} = \sigma^2_1\left(\frac{\Delta}{\Delta_{11}}\right)$$

OR

Q 5. a) Based on the multiple regression study of X_1 on X_2 and X_3, for multiple regression coefficient prove, in usual notations, that 08

$$b_{12.3} = \left(\frac{b_{12} - b_{13}b_{23}}{1 - b_{23}b_{32}}\right)$$

b) Show that 06

(1) $R^2_{1.23} \leq r^2_{12}$

(2) $r_{12.3}\, r_{23.1}\, r_{31.2} = b_{12.3}\, b_{23.1}\, b_{31.2}$