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Sr. No. of Question Paper : 289

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Roll No.....

Unique Paper Code : 237363

Name of the Paper : STP-303 : Statistical Methods – II

Name of the Course : B.Sc. (Mathematical Sciences)

Semester : III

Duration : 3 Hours

Maximum Marks : 75

**Instructions for Candidates**

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any six questions.

1. (a) If  $X_1$  and  $X_2$  are two independent chi-square variates with  $n_1$  and  $n_2$  d.f., respectively, then find the distribution of  $\frac{X_1}{X_2}$ .

- (b) Define Fisher's t-statistic with nd.f. Derive its sampling distribution.

(6,6½)

2. (a) Show that for large d.f., chi-square distribution tends to normal distribution.

- (b) Find the mode of F-distribution with  $n_1$  and  $n_2$  d.f., and show that it is always less than unity.

(6,6½)

3. (a) In a random sample of 500 men from a particular district of U.P., 300 are found to be smokers. In one of 1,000 men from another district, 550 are smokers. Do the data indicate that the two districts are significantly different with respect to the prevalence of smoking among men?

- (b) If  $X$  follows F-distribution with  $n_1$  and  $n_2$  d.f., then find  $\mu'_r$ . Also find mean and variance of the distribution.

(6,6½)

4. (a) Obtain the distribution function and hence the p.d.f. of the  $r^{\text{th}}$  order statistic  $X_{(r)}$  in a random sample of size  $n$  from a population with continuous distribution function  $P(\cdot)$ . Deduce the p.d.f. of the smallest and the largest sample observations.

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- (b) Define type I and type II errors. Explain these with the help of examples. Why are they called producer's risk and consumer's risk ? (6,6½)
5. (a) Find the distribution of sample correlation co-efficient  $r$  when  $\rho = 0$  for a random sample from a bivariate normal population.
- (b) Derive the expressions for the standard error of
- the mean of a random sample of size  $n$ , and
  - the difference of the means of two independent random samples of sizes  $n_1$  and  $n_2$ . (6½,6)
6. (a) Find if A and B are independent, positively associated or negatively associated in each of the following cases :
- $N = 1,000$      $(A) = 470$      $(B) = 620$     and  $(AB) = 320$
  - $(A) = 490$      $(AB) = 294$      $(\alpha) = 570$     and  $(\alpha B) = 380$
- (b) Show that the additive property holds good in the case of chi-square distribution. (6½,6)
7. (a) What is dichotomy ? What do you understand by consistency of given data ? How do you check it ?
- (b) The demand for a particular spare part in a factory was found to vary from day to day. In a sample study the following information was obtained.
- | Days :                 | Mon | Tue | Wed | Thu | Fri | Sat |
|------------------------|-----|-----|-----|-----|-----|-----|
| No. of parts demanded: | 24  | 25  | 10  | 20  | 26  | 15  |
- Test the hypothesis that the number of parts demanded doesn't depend on the day of the week.
- (Given the values of chi-square at 5, 6, 7 d.f. are respectively 11.07, 12.59 and 14.06 at 5% level of significance.) (6,6½)
8. (a) Define the following :
- statistic and parameter,
  - critical region,
  - null hypothesis and
  - level of significance.
- (b) Establish the relation between F distribution and chi-square distribution. (6½,6)