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Roll No. | | | | | | | | | | | |

S. No. of Question Paper : **5012**

Unique Paper Code : **237363** **D**

Name of the Paper : **Statistical Methods-II**

Name of the Course : **B.Sc. (Math. Sciences) Statistics**

Semester : **III**

Duration : **3 Hours** Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any *Six* questions.

1. (*a*) Define chi-square variate. Derive the p.d.f. of chi-square distribution with n degrees of freedom.

(*b*) Prove that for large degrees of freedom t-distribution tends to normal distribution. 6½,6

2. (*a*) If X_1 and X_2 are two independent chi-square variates with n_1 and n_2 degrees of freedom respectively, then find the distribution of $X_1/(X_1 + X_2)$.

(*b*) For how many degrees of freedom :

(*i*) Chi-square distribution reduces to negative exponential distribution.

(*ii*) *t*-distribution reduces to Cauchy distribution. 6½,6

P.T.O.

3. (*a*) Explain, stating clearly the assumptions involved, the *t*-test for testing the significance of the difference between two sample means.

(*b*) In one sample of 8 observations, the sum of the squares of deviations of the sample values from the sample mean was 84.4 and in the other sample of 10 observations it was 102.6. Test whether this difference is significant at 5% level of significance. (Given that $F_{0.05}(7,9) = 3.29$ and $F_{0.05}(9,7) = 3.69$. 6½,6

4. (*a*) Discuss the χ^2-test of goodness of fit of a theoretical distribution to an observed frequency distribution.

(*b*) 1000 apples are taken from a large consignment and 100 are found to be bad. Estimate the percentage of bad apples in the consignment and assign the limits within which the percentage lies. 6½,6

5. (*a*) Define sampling distribution and standard error. Show that in series of n independent trials with constant probability of success p, the standard error of the proportion of successes is $\sqrt{pq/n}$.

(*b*) For the exponential distribution $f(x) = e^{-x}$, $x \geq 0$. Show that the cumulative distribution function of $X_{(n)}$ in a random sample of size n is $F_n(x) = [1 - e^{-x}]^n$. Hence prove that as $n \to \infty$, the c.d.f. of $X_{(n)} - \log n$ tends to the limiting form $\exp[-\{\exp(-x)\}]$,, $-\infty < x < \infty$. 6½,6

6. (*a*) What do you mean by independence of attributes ? Give a criterion of independence for attributes A and B.

(*b*) The following table gives the distribution of students and also of regular players among them, according to age in completed years :

Age in Years	No. of Students	Regular Players
15	250	200
16	200	150
17	150	90
18	120	48
19	100	30
20	80	12

Calculate the coefficient of association between majority and playing habits, on the assumption that majority is attained in 18^{th} year. 6½,6

7. (*a*) Show that the mode of the F-distribution with n_1 (≥ 2), n_2 d.f. is given by $\frac{n_2(n_1 - 2)}{n_1(n_2 + 2)}$ and is always less than unity.

(*b*) Define Fisher's *t*-statistic. Show that Student's '*t*' is a particular case of Fisher's '*t*'. 6½,6

P.T.O.

8. (*a*) Define the following terms :

(*i*) Null hypothesis;

(*ii*) Types of error;

(*iii*) Level of significance;

(*iv*) One tailed and two tailed test.

(*b*) Discuss test of significance for single proportion. Write down 95% and 99% confidence limits for the population proportion P. 6½,6