# 2203E1299

Candidate's Seat No :_____

**B.Sc. Semester-5 Examination**

**CC 302**

**Statistics**

**March-2024**

**Time : 2-30 Hours]** **[Max. Marks : 70**

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1. (i) Derive the moment generating function of $\chi^2_n$ distribution. Hence determine coefficient of skewness and kurtosis. Show that as $n$ (the degrees of freedom) tends to $\infty$, chi-square distribution tends to normal distribution.

   (ii) Define $\chi^2$-variate. Derive its probability density function.

   **OR**

   (i) Discuss in detail any one application of $\chi^2$ distribution.

   (ii) If $\chi^2$ is chi-square variate with $n$ degrees of freedom, then show that $\sqrt{2\chi^2} - \sqrt{2n-1}$ is standard normal variate for large value of $n$.

2. (i) Define Student's $t$ variate. Derive the probability density function of Student's $t$ variate.

   (ii) Derive the distribution of sample correlation coefficient r when population correlation Coefficient $\rho = 0$.

   **OR**

   (i) Explain in detail the application of $t$-distribution for testing difference between two means.

   (ii) Derive the expression for the mean deviation about mean of $t$ variate with $n$ degrees of freedom.

3. (i) Define Fisher's $Z$ distribution. Obtain its probability density function.

   (ii) Define $F$ variate and derive its p.d.f. If $F$ is $F$-variate with $(n_1, n_2)$ d.f. then show that $\frac{1}{F}$ is $F$-variate with $(n_2, n_1)$ d.f.

   **OR**

   (i) State and prove the relation between $t$ and $F$ distribution.

   (ii) Define Snedecor's $F$-distribution. Obtain expression for its mean and variance. Also show that mode of $F$ distribution is less than unity.

4. (i) Discuss square root transformation on Poisson variate with parameter $\lambda$.

   (ii) Discuss in detail Logarithmic transformation.

   **OR**

   (i) Discuss in detail Fisher's $Z$-transformation for correlation coefficient.

   (ii) Discuss in detail $\sin^{-1}$ transformation.



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B.Sc. Semester V (Statistics STA-302)
Semester Examination

5. Attempt any **Seven**.

(i) State the relation between $F$ and $\chi^2$ distribution.

(ii) What is the another name for Fisher's $Z$ transformation?

(iii) State the application of Fisher's $Z$ distribution.

(iv) What is the distribution of ratio of two independent chi-square variates with respective degrees of freedom $m$ and $n$?

(v) What is the another name for Fisher's $Z$ transformation?

(vi) What is the mean and variance of $t$ distribution?

(vii) Let $t \sim t_n$. What is the distribution of $t$ when $n = 1$? State the name of the distribution.

(viii) Let $X \sim \chi^2_n$. State the characteristics function of $X$.

(ix) Highlight the difference between normal curve and $t$ curve.

(x) What are the uses of variate transformation?

(xi) State the additive property of $\chi^2$ distribution.

(xii) Define Fisher's $t$-variate.

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End of Paper.