# 1411E1200

Candidate's Seat No :________

**B.Sc. (NEP) Sem.-5 Examination**

**DSC-C-352**

**Statistics**

**November-2025**

**Time : 2-00 Hours]** **[Max. Marks : 50**

1. (a) Define $\chi^2$-variate. Derive its probability density function.
   (b) Discuss in detail any one application of $\chi^2$ distribution.

**OR**

   (a) 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 $n$.
   (b) 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.

2. (a) Derive the expression for the mean deviation about mean of $t$ variate with $n$ degrees of freedom.
   (b) Explain in detail the application of $t$-distribution for testing difference between two means.

**OR**

   (a) Define Student's $t$ variate. Derive the probability density function of Student's $t$ variate.
   (b) Derive the distribution of sample correlation coefficient r when population correlation Coefficient $\rho = 0$.

3. (a) 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.
   (b) State and prove the relation between $t$ and $F$ distribution.

**OR**

   (a) Define Snedecor's $F$-distribution. Obtain expression for its mean and variance. Also show that mode of $F$ distribution is less than unity.
   (b) Define Fisher's $Z$ distribution. Obtain its probability density function.

4. (a) State and Prove the Tchebychev's Inequality.
   (b) State and prove the Bernoulli's Law of Large Numbers.

**OR**

   (a) State and prove the Lindberg-Levy Form of Central Limit Theorem.
   (b) State and prove the Chebychev's Theorem.

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E 1200-2

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

5. Attempt any **TEN**.

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

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

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

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

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

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

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

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

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

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

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

(xii) Define convergence in probability.

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End of Paper.