NE-106

December-2015

B.Sc., Sem. – V

Core Course-304 : Statistics

Time : 3 Hours] **[Max. Marks : 70**

1. (a) Define a chi-square variate and derive the probability density function of chi-square distribution with n degrees of freedom.

OR

Derive the moment generating function of chi-square distribution and hence find its mean and variance.

(b) Write a short note on "Chi-square Probability Curve".

OR

If X_1 and X_2 are two independent chi-square variates with n_1 and n_2 degrees of freedom, then derive the distribution of X_1/X_2.

2. (a) Elucidate : "Discovery of Student's t-distribution is regarded as a landmark in the history of statistical inference."

OR

Explain the limiting form of t-distribution. Also draw a rough graph of t-distribution with necessary explanation.

(b) Derive the expression (formula) of even ordered central moments of t-distribution and hence find Pearson's coefficients.

OR

(b) Establish a test procedure for testing the significance of population

    (i)   correlation coefficient

    (ii)   regression coefficient

3. (a) Define F-statistics and derive the probability function of F-distribution as conceived by Snedecor.

OR

Obtain the expressions for r^{th} moment about origin for F-distribution and hence find first four central moments.

(b) Derive the mode of F-distribution and comment on it.

OR

Derive relation between

    (i)   F and χ^2

    (ii)   'F' and 't'

4. (a) Define and explain the concept of 'Compound Distribution".

OR

Derive Negative Binomial Distribution as a compound distribution of Poisson and Gamma Distributions.

(b) Write a detailed note on: "Compound Binomial Distribution".

OR

If X has a Poisson distribution with parameter λ being a random variable of the continuous type with the density function

$$f(\lambda) = \frac{a^v}{\Gamma(v)} \cdot e^{-a\lambda}\lambda^{(v-1)};\ \lambda > 0,\ a > 0,\ v > 0$$

Find compound distribution of X.

5.   Answer the following short questions briefly :

(1)   Why the chi-square test is sometimes considered to be a non-parametric test ?

(2)   How can you obtain Normal distribution from a chi-square distribution ?

(3)   What is the value of skewness for chi-square distribution with n d.f. ?

(4)   State the conditions for constraints on cell frequencies for the validity of chi-square test.

(5)   Name the scientist who wrote under pseudonym of 'Student'.

(6)   Comment: "Fisher's 't' is a particular case of Student's 't'".

(7)   Comment: "In Fisher's 't' the d.f. is the same as the d.f. of chi-square variate".

(8)   What can you say about the independence of two samples while applying "Paired t-test" for difference of means ?

(9)   State the values of mean and variance of the Normal Distribution to which the F-distribution tend to, for large degrees of freedom 'n_1' and 'n_2'.

(10) State the condition under which the mode of F-distribution exists.

(11) What do we obtain if we put $F = e^{2z}$ i.e. $Z = 0.5 \ln F$ in G.W. Snedecor's F-distribution with (v_1, v_2) d.f. ?

(12) Which statistical test is best used for testing the equality of two population variances ?

(13) State one application of Z distribution.

(14) What can you say about the relation between the values of A.M. and H. M. for a F-distribution with $[(n-1), (n-1)]$ d.f ?

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