Exam.Code:0003
Sub. Code: 0245

2012

B.A./B.Sc. (General) Third Semester

Statistics

Paper – 201: Statistical Inference

Time allowed: 3 Hours

Max. Marks: 65

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit. Use of electronic calculator with four basic mathematical operations and upto one memory is allowed. Various symbols used have their usual meaning.*

x-x-x

1. Answer the following:-
   i) What do you mean by consistent estimator?
   ii) Define point estimate of a parameter with example.
   iii) Define sampling distribution of a statistic?
   iv) State the Factorization theorem of sufficiency.
   v) Distinguish between level of significance and p-value.
   vi) Give an example of an estimator which is consistent but not unbiased.
   vii) State the applications of t-distribution. (2,2,2,2,2,1,2)

Unit-I

2: a) Explain the concept of efficient and sufficient estimators. Also, find the sufficient statistic for population mean (μ) and variance (σ^2) in case of normal population $N(\mu, \sigma^2)$. (10)

b) Write the properties of Chi-Square distribution. (3)

3: a) Define Maximum likelihood estimator. If a random sample of size n is drawn from a Normal population $N(2, \theta^2)$ then obtain the maximum likelihood estimator of parameter 'θ^2'.

b) If $X_i \overset{IID}{\sim} N(\mu, \sigma^2)$ then show that $sample\ variance\ s^2 = \frac{1}{n}\sum_{i=1}^{n}(X_i - \overline{X})^2$ is a consistent estimator of population variance σ^2. (7, 6)

P.T.O.

4: a) Define F-distribution. Derive its probability density function.

b) Let $X_1, X_2, \ldots, X_n$ are independent Poisson variates with parameters λ_i; $i = 1,2,\ldots,n$ respectively, then derive the distribution of their sum $(X_1 + X_2 + \ldots + X_n)$. (7, 6)

5: a) Show the independence of sample mean and variance in random sampling from a normal distribution.

b) Let $x_1, x_2, \ldots, x_n$ be a random variables from a uniform population on $[0, \theta]$. Find the unbiased and consistent estimator for θ. (8, 5)

Unit-II

6: a) Find the sampling distribution of the difference of two sample proportions in case of large samples, when the two populations distributed normally. Also, obtain the 100(1-α)% confidence interval for difference of two proportions.

b) Define sample proportion. Obtain its standard error. (8, 5)

7: a) Find the sampling distribution for sample mean in case of normal population when the population variance (σ^2) is unknown.

b) An I.Q. test was administered to 5 persons before and after they were trained. The results are given below:

Candidates-	I	II	III	IV	V
I.Q. before training:	112	122	125	134	127
I.Q. after training:	118	116	123	132	119

Test whether there is any change in I.Q. after the training programme (Given $\alpha = 1\%$).

c) A random sample of 38 pairs of observations from a normal population gave a correlation coefficient of 0.4. Is this significant of correlation in the population at 5% level of significance? (4, 5, 4)

8: a) Find the sampling distribution of the difference of two sample means for two normal populations, when population variances are equal and unknown and also find the confidence interval for difference of two means.

b) To test the significance of the difference between two independent correlation coefficients. (8, 5)

9: Write short notes on the following:

a) Paired-t test for difference of means.
b) Chi-square test for Independence of attributes.
c) Fisher's Z-Transformation.
d) One-Tailed tests. (4, 4, 4, 1)

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