2015

(3rd Semester)

STATISTICS

THIRD PAPER

(Statistical Inference)

Full Marks : 55

Time : 2½ hours

(PART : B—DESCRIPTIVE)

(*Marks* : 35)

The questions are of equal value

UNIT—I

1. What are the requirements of good estimator? Explain with examples. Let $X_1, X_2, \dots, X_n$ be a random sample from $B(n_i, p)$. If $T_1 = \sum_{i=1}^{n} X_i / n$ and $T_2 = \sum_{i=1}^{n} X_i / (n+1)$, then find the efficiency of T_1 with respect to T_2.

OR

2. Let $X_1, X_2, ..., X_n$ be a random sample follows $P(\lambda_1)$. Find the distribution of $T = \sum_{i=1}^{n} X_i$.

UNIT—II

3. Derive the F-distribution.

OR

4. Suppose that Z has the standard normal distribution, V has the chi-squared distribution with n degrees of freedom, where $n \in (0, \infty)$, and that Z and V are independent. Find the distribution of random variable $T = \frac{Z}{\sqrt{V/n}}$. Also find the mean of T.

UNIT—III

5. If $x \geq 1$ is the critical region for testing $H_0 : \theta = 2$ against the alternative $H_1 : \theta = 1$, on the basis of single observation from the population

$$f(x, \theta) = \theta e^{-\theta x};\ 0 \leq x < \infty$$

obtain the value of type-I and type-II errors.

OR

6. Explain in detail the use of central limit theorem for testing a single mean and single proportion.

UNIT—IV

7. Describe the—

(a) test for equality of two means if populations are independent and variances are known;

(b) test for the significance of sample correlation coefficient.

OR

8. Explain the testing of equality of means of bivariate distribution.

UNIT—V

9. Define Fisher's z-transformation and give its uses.

OR

10. Explain the test of independence of two attributes.

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(3rd Semester)

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(PART : A—OBJECTIVE)

(*Marks* : 20)

The figures in the margin indicate full marks for the questions

SECTION—A

(*Marks* : 5)

Put a Tick (✓) mark against the correct answer in the brackets provided for it : 1×5=5

1. Let $X_1, X_2, \ldots, X_n$ be a random sample, then which of the following is a statistic?

(a) $T = \dfrac{\sum_{i=1}^{n} X_i}{n} + a$, where a is unknown ( )

(b) $T = \dfrac{\sum_{i=1}^{n} X_i}{n} + a$, where a is known ( )

(c) $T = \sum_{i=1}^{n} X_i + a$, where a is unknown ( )

(d) None of the above ( )

2. If X_1, X_2 and X_3 are independent and follows χ_2^2, χ_3^2 and χ_4^2 respectively, then the distribution of $X_1 + X_2 + X_3$ is χ^2 with degrees of freedom is

(a) 7 ( )

(b) 8 ( )

(c) 9 ( )

(d) 10 ( )

3. In hypothesis testing, the hypothesis tentatively assumed to be true is

(a) the alternative hypothesis ( )

(b) the null hypothesis ( )

(c) neither null nor the alternative ( )

(d) None of these alternative is correct ( )

4. A sample of 12 specimens taken from a normal population is expected to have a mean 50 gm/cc. The sample has mean 64 mg/cc with a variance of 25. To test the hypothesis, you will use

(a) z-test ( )

(b) F-test ( )

(c) t-test ( )

(d) χ^2-test ( )

5. An important application of the chi-square distribution is

(a) making inferences about a single population variance ( )

(b) testing for goodness of fit ( )

(c) testing for the independence of two variables ( )

(d) All of these alternatives are correct ( )

SECTION—B

(*Marks* : 15)

Answer the following questions : 3×5=15

1. Let $X_1, X_2, \ldots, X_n$ be a random sample follows $P(\lambda)$. If $T = \sum_{i=1}^{n} X_i$, find the distribution of T.

2. Show that Cauchy distribution is a particular case of t-distribution.

3. Define critical region, types of errors for testing hypothesis.

4. Write a short note on 'testing for the significance of sample correlation coefficient'.

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5. Explain Pearson's chi-square test for goodness of fit.

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