

B.Sc. (Honours) Examination, 2018
Semester-III
Statistics (Allied)
Course : BSA-31
Sample Survey and Statistical Inference

Time : 3 Hours

Full Marks : 40

Questions are of value as indicated in the margin

Answer **any four** questions from the following

1. (a) Let $X_1 \sim \text{Poisson}(\lambda_1)$ and $X_2 \sim \text{Poisson}(\lambda_2)$ independently. Then find the marginal distribution of $X_1 + X_2$ and the conditional distribution of X_1 given $X_1 + X_2 = Z$. 6

- (b) Suppose X follows the following pdf

$$f(x) = \begin{cases} 1, & \text{if } 0 < x < 1, \\ 0, & \text{otherwise.} \end{cases}$$

Then find the distribution of $Y = -2\ln X$. 4

2. (a) Write down the pdf of t distribution with degrees of freedom n . 4
(b) Find the limiting form as $n \rightarrow \infty$. 6
(c) Define the terms *parameter* and *statistic*. 2
3. (a) Define minimum variance unbiased estimator. 2
(b) If $X \sim \text{Binomial}(n, p)$, then prove that $T = \frac{X(X-1)}{n(n-1)}$ is an unbiased estimator of p^2 . 5
(c) Distinguish between type-I and type-II error in context of hypothesis testing. 3

4. In SRSWOR of size n from a finite population of size N , find an unbiased estimator of population mean and unbiased estimator of the variance of this unbiased estimator. 4+6 = 10

5. Let X_1, X_2, \dots, X_n be a random sample of size n drawn from $N(\mu, \sigma^2)$ population. Show that the sample mean and sample variance are independently distributed. Show that the sample mean follows a normal distribution. 10

6. Describe the total procedure for testing the null hypothesis $H_0 : \mu = \mu_0$ against all possible alternative when μ is mean of normal population. 10
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