



বিদ্যাসাগর বিশ্ববিদ্যালয়
VIDYASAGAR UNIVERSITY
Question Paper

B.Sc. Honours Examinations 2022

(Under CBCS Pattern)

Semester - IV

Subject : STATISTICS

Paper : C 9-T

Statistical Inference-I and Sampling Distributions

Full Marks : 40

Time : 2 Hours

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Group-A

Answer any *two* questions :

10×2=20

1. Suppose there is P proportion of smokers in city A and Q proportion of smokers in another independent city B. Describe how you can test for the equality of proportion of smokers in the two cities A and B based on two independent samples of sizes n_1 and n_2 from the two cities A and B respectively. 10

2. (i) Show that the mode of the F-distribution with $v_1 (\geq 2)$, v_2 d.f. is given by

$$\frac{v_2(v_1 - 2)}{v_1(v_2 + 2)} \text{ and is always less than unity.}$$

P.T.O.

- (ii) Let $X_{(1)}, X_{(2)}, \dots, X_{(n)}$ be the order statistics for a random sample of size n from the exponential distribution with p.d.f. $f(x) = \begin{cases} \lambda e^{-\lambda x}; & x > 0 \\ 0; & \text{o.w.} \end{cases}$. Find the p.d.f. of the sample range. 4+6

3. Suppose X and Y are two iid continuous standard uniform variables. Find the joint distribution of $\text{Max}(X, Y)$ and $\text{Min}(X, Y)$. Hence find the distribution of (i) $\text{Max}(X, Y)$ (ii) $\text{Min}(X, Y)$. 10
4. How do you test for, and set confidence limits to, the ratio of two means of a bivariate normal distribution? 10

Group-B

Answer any **four** questions : 5×4=20

5. Explain the following terms :

- (i) Critical Region
- (ii) Level of significance 2½+2½

6. What do you mean by standard error of a statistic? Show that in a series of independent trials with constant probability of success p , the standard error of the proportion of success is

$$\sqrt{\frac{pq}{n}} \text{ where } q = 1 - p. \quad \text{2+3}$$

7. Suppose a random sample of high school students is selected to determine if there is a difference between how long male and female students sleep at night. If m male students are randomly chosen and yield an average of k hours of sleep with a standard deviation of s_1 and n female students with an average of l hours with standard deviation of s_2 . Construct a $100(1-\alpha)\%$ confidence interval for the difference between the two mean hours of sleep of male vs female. 5

8. Suppose X and Y are two independent rectangular variables on the range 0 to θ each. Where $\theta (> 0)$ is a constant. Find the distribution of $|X - Y|$. 5

9. Suppose $X_1, X_2, \dots, X_n, X_{n+1}$ is a random sample from $N(\mu, \sigma^2)$. Also suppose \bar{X} and S_2 are the sample mean and sample variance of the first n sample observations. Obtain the

sampling distribution of $\frac{X_{n+1} - \bar{X}}{S} \sqrt{\frac{n}{n+1}}$. 5

P.T.O.

10. An urn contains 10 marbles, of which M are white and $10 - M$ are black. To test that $M = 5$ against the alternative hypothesis that $M = 6$, one draws 3 marbles from the urn without replacement. The null hypothesis is rejected if the sample contains 2 or 3 white marbles; otherwise, it is accepted. Find the size of the test and its power. 5
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