2/41

2011E696

Candidate's Seat No :_____

M.Sc Sem-3 Examination

501

Statistics

Time : 2-30 Hours] **November-2024** **[Max. Marks : 70**

Note: Attempt all questions.

Q.1

(i) Define Test Function, Randomised Test Function and Non-Randomised Test Function. [7]

(ii) State and prove N-P fundamental lemma for randomized test. [7]

OR

(i) Let $X \sim$ Binomial distribution. Check whether distribution possess MLR property in $T(X)$ or not. [7]

(ii) Define unbiased test. Show that test obtained by N-P lemma is always unbiased. [7]

Q.2

(i) Define Likelihood Ratio Test . Under what circumstances would you recommend this test? State its properties. [7]

(ii) Let $X_1, X_2, \cdots, X_n$ be a random sample from $U(0,\theta)$, $\theta > 0$. Obtain $(1-\alpha)100\%$ UMA CI for θ. [7]

OR

(i) Let $X_1, X_2, \cdots, X_n$ be a random sample from $N(\mu, \sigma^2)$, where σ^2 is known. Develop the likelihood ratio test for testing $H_0 : \mu = \mu_0$ (specified) against $H_1 : \mu < \mu_0$. [7]

(ii) Let $X_1, X_2, \cdots, X_n$ be a random sample from $f(x,\theta) = e^{-(x-\theta)}$, $x > \theta$. Obtain $(1-\alpha)100\%$ UMA CI for θ. [7]

Q.3

(i) Develop the S.P.R.T. for testing $H_0 : \theta = \theta_0$ against $H_1 : \theta = \theta_1 (> \theta_0)$, where θ is the parameter of a Poisson distribution. Find approximate expressions for OC function and ASN function of the test. [7]

(ii) Develop the S.P.R.T. for testing $H_0 : \theta = \theta_0$ against $H_1 : \theta = \theta_1 (> \theta_0)$, based on a random sample of size n from a population with p.d.f.

$$f(x,\theta) = \frac{1}{\theta} e^{-x/\theta}, x > 0, \theta > 0$$

Also obtain ASN and OC functions. [7]

(P.T.O)

OR

(i) Develop the S.P.R.T. for testing $H_0 : \pi = \pi_0$ against $H_1 : \pi = \pi_1$, based on a random sample from a binomial population with parameters (n, π), n being known. Obtain its OC and ASN functions. [7]

(ii) Give the S.P.R.T. for testing $H_0 : \theta = \theta_0$ against $H_1 : \theta = \theta_1 (> \theta_0)$, in sampling from a normal density

$$f(x,\theta) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left[\frac{-1}{2}\left(\frac{x-\theta}{\sigma}\right)^2\right] \quad , \quad -\infty < x < \infty$$

where σ is known. Also obtain its OC function. [7]

Q.4

(i) Explain Kolmogorov-Smirnov one-sample test. [7]

(ii) Explain Kruskal-Wallies one-way ANOVA test. [7]

OR

(i) Explain Kolmogorov-Smirnov two-sample test. [7]

(ii) Explain Friedman's two- way analysis of variance test. [7]

Q.5 Answer any seven: [14]

(i) Neyman-Pearson lemma is used for finding most powerful test for

(A) simple vs simple hypothesis (B) simple vs composite hypothesis

(C) composite vs simple hypothesis (D) composite vs composite hypothesis

(ii) Define UMPU test.

(iii) Give an example of simple hypothesis.

(iv) Define UMA confidence set.

(v) A structure determined by a statistic that is independent of a sufficient statistic is known as_____.

(vi) Test with Neyman structure is a _____

(A) Similar test (B) subset of similar tests

(C) not a subset of similar test (D) none of these

(vii) In SPRT α and β are _____.

(viii) In Wald's SPRT sample size is _____.

(ix) Sequential Probability Ratio Test of the general linear hypothesis terminates with probability

(A) 0 (B) 0.5 (C) 1 (D) none of the above

(x) The Kruskal-Wallies test is the non parametric alternative to the _____.

(A) Factorial design (B) One-way ANOVA (C) Two-way ANOVA (D) none of the above

(xi) Give one advantage of non parametric test.

(xii) Compare to parametric tests, the non parametric tests

(A) less accurate (B) less efficient

(C) computationally easier (D) (B) and (C) but not (A)

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