Registration Number:

Date & session:

**ST JOSEPH'S UNIVERSITY, BENGALURU -27**
**M.Sc. (STATISTICS) – 2nd SEMESTER**
**SEMESTER EXAMINATION: APRIL 2024**
**(Examination conducted in May / June 2024)**

**ST 8221 – Testing of Hypothesis and Interval Estimation**
**(For current batch students only)**

**Time: 2 Hours** **Max Marks: 50**

**This paper contains TWO printed pages and ONE part**

## PART-A

**Answer any FIVE of the following** **10 X 5 = 50**

1. A) State and prove NP Fundamental lemma.

   B) Define the following terms:

   i) p-value

   ii) Randomized and non-randomized test. Provide an example of each.

   iii) Type-I and Type –II errors (6+4)

2. A) Given a random sample of size n from $f(x, \beta)= \beta e^{-\beta x}$ , $x>0$ , obtain a UMP test of size alpha for testing Ho: $\beta \leq \beta_0$ v/s $H_1 : \beta > \beta_0$.

   B) Given a random sample of size n from geometric distribution. Construct MP test for testing $H_0 : p = p_0$ v/s $H_1 : p = p_1$ where $p_0 > p_1$. (6+4)

3. A) Give an example of a distribution that

   i) Possesses MLR property

   ii) Does not possess MLR property. Justify your answer in each case.

   B) Given a random sample of size n from Poisson distribution with mean $\lambda$ . Construct 100(1-α) % UMPU test for testing $H_0 : \lambda = \lambda_0$ vs $H_1 : \lambda \neq \lambda_0$. (3+7)

4. A) Given a random sample of size n from $N(\mu, \sigma^2)$ distribution. Derive Likelihood Ratio Test for testing $H_0 : \mu = \mu_0 \quad v/s \quad H_1 : \mu \neq \mu_o$

   B) Briefly describe the Score test. (7+3)

5. A) Derive the Bartlett test for homogeneity of variances.

   B) Describe Pearson's Chi-Square test for goodness of fit. (6+4)

6. A) State the relation between a UMP level α test and UMA (1-α) level confidence set.

   B) Derive 100(1-α)% UMA upper confidence bound for ɵ based on a sample of size n from truncated exponential with density $f(x,\theta) = e^{-(x-\theta)}$ , x>ɵ, ɵ>0 (3+7)

7. A) Given a random sample of size n from $N(\mu, \sigma_0^2)$. Construct $100(1-\alpha)\%$ confidence interval (C.I) for $\mu$, using this C.I determine the shortest expected length for $\mu$ where $\sigma_0^2$ is known.

   B) Define a pivot and with an example describe the pivotal method of constructing a confidence interval. (6+4)

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