Registration Number:

Date & session:

ST.JOSEPH'S UNIVERSITY, BENGALURU -27
M.Sc. (STATISTICS) – I SEMESTER
SEMESTER EXAMINATION: OCTOBER 2022
(Examination conducted in December 2022)
ST 7221 – THEORY OF POINT ESTIMATION

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

This paper contains ONE printed page and ONE part.

PART-A

Answer any FIVE questions. $\mathbf{10 \times 5 = 50}$

1. A).Define Location-scale family and Pitman family of distributions. Check whether U (0, 5θ) belongs to Pitman family or not. (5)
   B).Define single parameter exponential family. Check whether Negative Binomial distribution with parameter θ belongs to single parameter exponential family. (5)
2. A).Show that convex combination of two unbiased estimators is unbiased. (3)
   B).Prove that sample mean is always a consistent estimator of population mean 'μ' provided the population has got finite variance. (4)
   C).Let X_1 and X_2 are observations from Poisson distribution with parameter 'λ'. Verify whether X_1+ $2X_2$ is sufficient or not. (3)
3. A) Describe consistency with its sufficient conditions. (2)
   B) The density of uniform distribution is given by $f(x) = \frac{1}{\theta},\ 0 < x < \theta$.If $Y = X_{(n)}$ is sufficient statistic for parameter θ then verify whether it is complete statistic? (5)
   C) Obtain the moment estimator of parameter p when X follows Negative Binomial distribution with parameter 'r' and 'p'. (3)
4. A) State and prove Neyman Factorization theorem. (6)
   B) Find the minimal sufficient statistic for (μ, σ^2) when the random sample is drawn from Normal distribution with parameters μ and σ^2. (4)
5. A State and prove Rao-Blackwell theorem. (6)
   B) Define minimum variance bound estimator. Obtain lower bound for binomial distribution and give your comment. (4)
6. A) State and prove Cramer-Rao inequality. (6)
   B) Find the Fisher information function contained in a random sample of size n for the distribution with probability density function $f(x,\theta) = \frac{\theta}{x^{\theta+1}},\ x > 1, \theta > 0$. (4)
7. A) Define UMVUE. Construct UMVUE for p^2 when the sample is drawn from $B(1,p)$ distribution. (6)
   B) Define maximum likelihood estimator (MLE). Obtain the MLE of Geometric distribution with parameter 'p'. (4)

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