BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: IMSc **SEMESTER : V/ADD**
BRANCH: QEDS **SESSION : MO/2025**

SUBJECT: ED307 PARAMETRIC INFERENCE

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

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			CO	BL
Q.1	Let $X_1, X_2, ..., X_5$ be a sample of size 5 from the uniform distribution on the interval $(0,\theta)$, where θ is unknown. Let the estimator of θ be k X_{max} , where k is some constant and X_{max} , is the largest observation. In order k X_{max} to be an unbiased estimator, what should be the value of constant k ?	[5]	C01	III
Q.2	Show that $\bar{X} = \sum_{i=1}^{n} X_i/n$, in random sampling from $f(x,\theta) = \begin{cases} \frac{1}{\theta}\exp(-x/\theta) & x > 0 \\ 0 & \text{otherwise} \end{cases}$ where $0<\theta<\infty$ is an uniformly minimum variance unbiased estimator for θ.	[5]	C01	II
Q.3	If $X_1, X_2, ..., X_n$ is a random sample from the density function: $f(x,\theta) = \begin{cases} 1 & \theta < x < \theta+1 \\ 0 & \text{otherwise} \end{cases}$ Show that the sample mean $\bar{X}$ is an unbiased and consistent estimator for $\theta + \frac{1}{2}$.	[5]	C01	II
Q.4	Let $X_1, X_2, ..., X_n$ be a random sample from a distribution with probability density function : $f(x,\theta) = \begin{cases} 3\,\theta x^2 e^{-\theta x^2} & \text{for } 0 < x < \infty \\ 0 & \text{otherwise,} \end{cases}$ where $\theta > 0$ is an unknown parameter. Find a sufficient statistic for θ.	[5]	C02	III
Q.5	If $f(x;\theta_1,\theta_2) = \frac{1}{B(\theta_1,\theta_2)}\, x^{\theta_1-1}(1-x)^{\theta_2-1}$, then check whether it belongs to the exponential family and find the joint sufficient statistics for θ_1 *and* θ_2.	[5]	C02	V

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