BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID-SEMESTER EXAMINATION SP/2025)

CLASS: IMSc **SEMESTER: VI**
BRANCH: CQEDS **SESSION: SP/2025**

SUBJECT: ED313 NONPARAMETRIC METHOD AND DECISION THEORY

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**

			CO	BL
Q.1	A telecom company, "Company X", plans to invest further in one of its two plans depending on which is more preferred by its users. Suppose that each of the 15 randomly chosen people registered with Company X were asked to choose if they prefer plan A or plan B offered by that company. The results showed that 12 of those people preferred plan B. Is this evidence significant enough to reject the hypothesis that both plans are equally preferred among the registered users against the claim that Plan B is preferred over Plan A, using the Sign Test at 95% and 99% significance levels?	[5]	1	3
Q.2(a)	Define quantile function and derive its first and second derivatives.	[2]	1	2
Q.2(b)	Find the distribution of the range of a random sample of size n from the exponential distribution $f_X(x) = 4exp(-4x), for\ x > 0$.	[3]	1	4
Q.3	Let Xi denote the length, in centimetres, of a randomly selected fish, i = 1, 2, …, 10. If we obtain the following data set: 5.0, 3.9, 5.2, 5.5, 2.8, 6.1, 6.4, 2.6, 1.7, 4.3. Can we conclude that the median length of fish differs significantly from 3.7 centimetres? Use the Sign and Wilcoxon Signed Rank Test at 5% of the significance levels.	[5]	2	3
Q.4	Show that the empirical cumulative distribution function is an unbiased estimate of the cumulative distribution function.	[5]	2	2
Q.5	A group of 12 children was tested to determine how many digits they could recall from memory after hearing them once. They were then given a practice session to improve their memory recall. One week later, they were retested. The results before and after the practice session are given below: Recall Before: 6, 4, 5, 7, 6, 4, 3, 7, 8, 4, 6, 5 Recall After : 6, 6, 4, 7, 6, 5, 5, 9, 9, 7, 8, 7 Assuming that the distribution of the differences in recall scores before and after the practice session is symmetric about its median, test at the 5% significance level whether the memory practice session improves children's recall performance using the Wilcoxon matched-pair signed-rank test. (Using a Wilcoxon signed-rank test table for n=9 at α=0.05 (one-tailed test), the critical value is 9)	[5]	2	3

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