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

CLASS: IMSc **SEMESTER : II**
BRANCH: QEDS **SESSION : SP/2025**

SUBJECT: ED24113 STATISTICAL METHODS II

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1	Provide the algorithm for simulating a random variable having density function, $f(x) = 30(x^2 - 2x^3 + x^4)$, $0 < x < 1$ using rejection method.	[10]	C01	II
Q.2(a)	Suppose $X_1, X_2, \ldots, X_7$ is a random variable from a population X with density function , $f(x;\beta) = \frac{x^6 \, e^{-x/\beta}}{\Gamma(7)\,\beta^7}$, if $0 < x < \infty$. Find an estimator of ß by the moment method.	[5]	C02	III
Q.2(b)	If $X_1, X_2, \ldots, X_n$ is a random sample from a distribution with density function defined as $f(x,\theta) = (1-\theta)x^{-\theta}$, if $0 < x < 1$. What is the maximum likelihood estimator of θ?	[5]	C02	III
Q.3(a)	Suppose X is a random variable with density function, $f(x) = 2x\theta^2$, if $0 < x < \frac{1}{\theta}$. If 3kX is an unbiased estimator of θ^{-1}, then what is the value of k?	[5]	C03	V
Q.3(b)	Define Cramer Rao Lower Bound(CRLB). Let $X_1, X_2, \ldots, X_n$ be a random sample of size n from a distribution with density function, $f(x,\theta) = 3\theta x^2 e^{-\theta x^3}$, if $0 < x < \infty$. What is the CRLB for the variance of unbiased estimator of the parameter θ?	[5]	C03	V
Q.4(a)	What do you mean by type I and type II error in testing of hypothesis? A company claims that the mean length of its electric bulb is 28 months. A random sample of 10 bulbs has the following length of life (in months): 22, 24, 26, 32, 28, 20, 23, 34, 30 and 43. Test the claim of the company at 5% level of significance. ($t_{0.05,9} = 2.262$)	[5]	C04	III
Q.4(b)	Forty people were attacked by a disease and only 36 survived. Will you reject the hypothesis that the survival rate, if attacked by this disease, is 85% in favour of the hypothesis that it is more, at 5% level. ($Z_{tab} = 1.645$)	[5]	C04	III
Q.5	The following figures show the distribution of digits in numbers chosen at random from a telephone directory: Digits : 0 1 2 3 4 5 6 7 8 9 Total Frequency : 1026 1107 997 966 1075 933 1107 972 964 853 10,000 Test whether the digits may be taken to occur equally frequently in the directory. ($\chi^2_{0.05,9} = 16.919$)	[10]	C05	III

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