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

CLASS: IMSc. **SEMESTER : II**
BRANCH: QEDS **SESSION : SP/2023**

SUBJECT: ED113 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.

Q.1(a) If $x_0 = 5$ and $x_n = 3\, x_{n-1} \bmod 150$, find x_1, x_2, x_3, x_4 and x_5. [5]

Q.1(b) Give a method for generating a random variable having the density function. [5]
$f(x) = e^x/(e-1),\ 0 \le x \le 1.$

Q.2(a) Let $X_1, X_2, \ldots, X_n$ be normal random variables with mean μ and variance σ^2. Find the method of moments estimators of μ and σ^2. [5]

Q.2(b) For the above problem find the maximum likelihood estimators of μ and σ^2. [5]

Q.3(a) A die is thrown 240 times, yielding the data in the following table: [5]

Score	1	2	3	4	5	6
Frequency	57	39	28	28	36	52

Perform a goodness of fit test for the hypothesis that the die is fair. $X^2_{4,0.05} = 9.488$.

Q.3(b) A random sample of 60 printed circuit boards is taken and the number of defects is recorded. The results are as follows. [5]

Number of defects	Observed Frequency
0	31
1	15
2	13

Perform a goodness of fit test to determine whether the assumption of Poisson distribution seems appropriate as a model for these data. $X^2_{1,0.05} = 3.841$.

Q.4(a) State Factorization Theorem for sufficiency. [5]

Q.4(b) Let $X_1, X_2, \ldots, X_n$ be a random sample drawn form U(0,θ), where θ is unknown. Find the sufficient statistic for θ. [5]

Q.5(a) Explain logit and probit regression models. [5]

Q.5(b) Suppose we collect data for a group of students in a statistics class with variables X_1 = hours studied, X_2 = undergrad GPA, and Y = receive an A. We fit a logistic regression and produce estimated coefficient, $\widehat{\beta_0} = -6, \widehat{\beta_1} = 0.05, \widehat{\beta_2} = 1$. Estimate the probability that a student who studies for 40 h and has an undergrad GPA of 3.5 gets an A in the class. [5]

:::::18/07/2023:::::