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

CLASS: IMSC   SEMESTER : II
BRANCH: QEDS   SESSION : SP/2022

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. **Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.**

Q.1(a)   With $x_1 = 23$, $x_2 = 66$, and $x_n = 3x_{n-1} + 5x_{n-2}$ mod(100), $n \geq 3$, define the sequence $u_n = x_n/100$,   [5]
            $n \geq 1$. Find its first 14 values.

Q.1(b)   Give an efficient algorithm to generate first 10 units of a non-homogenous Poisson process   [5]   CO1
            having intensity function

$$\lambda(t) = \begin{cases} \dfrac{t}{5}, & 0 < t < 5 \\ 1 + 5(t-5), & 5 < t < 10. \end{cases}$$

Q.2   Suppose that X is a discrete random variable with the following probability mass function: [10]   CO2
            where $0 \leq \theta \leq 1$.

X	0	1	2	3
P(X)	2θ/3	θ/3	2(1-θ)/3	(1-θ)/3

A sample of 10 observations is drawn from the above distribution: (3,0,2,1,3,2,1,0,2,1).
Find the maximum likelihood estimate and method of moment estimate of θ.

Q.3   In a study relating to the traffic conditions in the city, the average daily numbers of motor   [10]   CO3
            car accidents during April, 1998 were found to be as follows.

Zone	Average Daily Number
North	17
East	13
South	10
West	12
Central	14

Do you think that the traffic problem is equally acute in all five zones? (Given $X^2_{0.05,4}$ =
9.488).

Q.4   If $X_1, X_2, ..., X_n$ ~ i.i.d. $N(\mu, \sigma^2)$, then find the MVUE of μ^2.   [10]   CO4

Q.5(a)   Suppose we collect data for a group of students in a statistics class with variables X_1 = hours   [5]
            studied, X_2 = undergrad GPA, and Y = receive an A. We fit a logistic regression and estimated
            coefficients, $\widehat{\beta 0}$ = -6, $\widehat{\beta 1}$= -6, $\widehat{\beta 2}$ = 1. Estimate the probability that a student who studies
            for 40 hours and has an undergrad GPA of 3.5 gets an A in the class.

Q.5(b)   How many hours would the student in part (a) need to study to have a 50% chance of getting   [5]   CO5
            an A in the class.

:::::19/07/2022:::::