

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

CLASS: ISc / MSc
BRANCH: MATH

SEMESTER : IX / III
SESSION : MO/2022

SUBJECT: MA503 STATISTICAL COMPUTING

TIME: 3:00 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.
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- Q.1(a) Give one example of a deterministic model and one example of a random model. [2] CO=1 BT=1.10
- Q.1(b) How does the concept of Kolmogorov complexity determine a sequence to be random? Illustrate with an example. [3] CO=1 BT=1.11
- Q.1(c) When is randomness genuine and when is it false? Why is false randomness useful? [5] CO=1 BT=1.23
- Q.2(a) What are the main challenges in pseudorandom number generation? [2] CO=2 BT=1.12
- Q.2(b) Using run test of randomness, verify whether the following sample can be regarded as random (you may take the level of significance as 5%):
12 32 15 24 8 0 18 9 11 7 58
20 53 42 17 6 4 16 3 19 1 39
65 37 78 81 5 2 29 41 98 73 42 [3] CO=2 BT=1.20
- Q.2(c) Explain the working of Feedback Shift register method. How will you generate U(0,1) variates using this method? [5] CO=2 BT=1.25
- Q.3(a) Write an algorithm to simulate an exponential variate with mean $\frac{1}{2}$ [2] CO=3 BT=1.25
- Q.3(b) Using two independent U(0,1) variate values as 0.5123 and 0.2814, simulate a Chi-Square variate with 2 degrees of freedom. [3] CO=3 BT=1.25
- Q.3(c) Write an algorithm to simulate the random variable X whose distribution is given below:- [5] CO=3 BT=1.20
- X: 0 1 2 3 4
P(X=x): 1/13 4/13 3/13 2/13 3/13
- Q.4(a) What is a linear model in regression analysis and why is it called linear? [2] CO=4 BT=1.11
- Q.4(b) "The strength of statistics lies in modeling". Justify this statement. [3] CO=4 BT=1.31
- Q.4(c) Explain Single Exponential Smoothing. When is it useful? [5] CO=4 BT=1.30
- Q.5(a) What is a Markov chain? What do you mean by its order? [2] CO=5 BT=1.10
- Q.5(b) How is Markov Chain Monte Carlo method of simulation different from ordinary Monte Carlo method? [3] CO=5 BT=1.11
- Q.5(c) Consider the following sequence of a first order Markov chain having three states A, B and C:- [5] CO=5 BT=1.25
- BCAABACBBACAACAABBC
You are given four U(0,1) variate values as 0.8145, 0.4126, 0.9215 and 0.7281.
Use these values to simulate four variates from the given Markov chain.

:::24/11/2022:::E