DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
UNIVERSITY OF BARISAL
Final EXAMINATION - 2023
Course Title: Simulation and Modeling
Course Code: CSE-3209
3rd year 2nd Semester
Session: 2022-23 (Admission: 2020-21)

Time: 3 hour

Marks: 60

Answer any five Questions from the followings.

1. a) How simulation plays important role in new innovation? [3]

   b) In which situations simulation is not a better choice? [3]

   c) What are different methods of studying a system before designing a simulation? [3]

   d) Classify simulation models. [3]

2. a) Briefly explain the differences between discrete system and continuous system with suitable figures. [4]

   b) Discuss the concept of "Time Advance Mechanism" with an example. [4]

   c) What are different components of a Discrete-event simulation models? Explain. [4]

3. a) Write short notes on the followings including their scope of implementation in simulation process: [12]

   i) Exponential Distribution   ii) Triangular Distribution

   iii) Lognormal Distribution   iv) Poisson Process

   v) Weibull Distribution   vi) Geometric Distribution

4. a) Define the following queuing system characteristics: [2]
   (i) calling population   (ii) Arrival process

   b) A classical inventory problem concerns the purchase and sale of newspapers. The paper seller buys the papers for 33 cents each and sells them for 50 cents each. (The lost profit from excess demand is 17 cents for each paper demanded that could not be provided.) Newspapers not sold at the end of the day are sold as scrap for 5 cents each. (the salvage value of scrap papers). There are three types of Newsday's, "good, "fair," and "poor," with probabilities of 0.35, 0.45, and 0.20, Respectively. The problem is to determine the optimal number of papers the newspaper seller should purchase. This will be accomplished by simulating demands for 20 days and recording profits from sales each day. The demand table and distribution of type of Newsday are given below. [10]

Demand Table

Demand	Demand probabilities			Cumulative probabilities			Range of Random Numbers		
	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor
40	0.03	0.10	0.44	0.03	0.10	0.44	0 – 3	0 – 10	0 – 44
50	0.05	0.18	0.22	0.08	0.28	0.66	4 – 8	11 – 28	45 – 66
60	0.15	0.40	0.16	0.23	0.68	0.82	9 – 23	29 – 68	67 -- 82
70	0.20	0.20	0.12	0.43	0.88	0.94	24 – 43	69 – 88	83 – 94
80	0.35	0.08	0.06	0.78	0.96	1.00	44 – 78	89 – 96	95 – 00
90	0.15	0.04	0.00	0.93	1.00	1.00	79 – 93	97 - 00	
100	0.07	0.00	0.00	1.00	1.00	1.00	94 – 00		

Distribution of Type of Newsday

Type	Probability	Cumulative Probability	Range of Random Numbers
Good	0.35	0.35	01 – 35
Fair	0.45	0.80	36 – 80
Poor	0.20	1.00	81 – 00

Simulate for the purchase of 70 newspapers per day for 20 days and compute the profit of news dealer. Random numbers for Type of News day: 94, 77, 49, 45, 43, 32, 49, 00, 16, 24, 31, 14, 41, 61, 85, 08, 15, 97, 52, 78
Random numbers for Demand: 80, 20, 15, 88, 98, 65, 86, 73, 24, 60, 60, 29, 18, 90, 93, 73, 21, 45, 76, 96

5. a) What are the problems may occur during the generation of random numbers? [3]

b) Define linear congruential method for generating random number. Use the linear congruential [4] method to generate a sequence of four (4) random numbers with $X0 = 27$, $a = 17$, $c = 43$, and $m = 100$.

c) What are the methods used for testing a random number? Suppose, five numbers 0.44, 0.81, [5] 0.14, 0.05, 0.93 are generated. Test the uniformity of the generated numbers using the Kolmogorov–Smirnov test with the level of significance $\alpha = 0.05$. [Critical value $D\alpha=0.565$]

6. a) What is the Kendall notation of Queuing System? [3]

b) Define a Markov chains and its application. [4]

c) Use the mixed congruential method to generate a sequence of three two-digit random [5] numbers with $X0 =37$, $\alpha=7$, $c=29$ and $m=100$.

7. a) Explain how simulation and modelling can play an important role in Manufacturing and [3] Material Handling System.

b) Briefly describe probable simulation processes in a Manufacturing System [Use an appropriate [6] example].

c) Define verification in simulation process? Describe techniques to perform verification on [3] simulation model.

8. a) Monte Carlo simulation is a special case of stochastic simulation? Comment. [3]

b) What method did we use to develop the model for the ATM (bank) case study? [3]

c) What is SIMSCRIPT? What is its importance? Discuss its various functions [3]

d) Write short note on Statistical output analysis. [3]