JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2023

B.Tech-IV Semester (CSE/IT)

COURSE CODE (CREDITS):18B11CI413 (02) MAX. MARKS: 35

COURSE NAME: Modeling and Simulation Techniques

COURSE INSTRUCTORS: Dr. Sunil Datt Sharma MAX. TIME: 2 Hours

Dr. Nafis Uddin Khan

Note: (a) All questions are compulsory.

(b)Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

---

Q1. Test for whether the 3rd, 8th, 13th, and so on, numbers in the following sequence are uncorrelated: **[06Marks, CO-02]**

0.12	0.01	0.23	0.28	0.89	0.31	0.64	0.28	0.83	0.93
0.99	0.15	0.33	0.35	0.91	0.41	0.60	0.27	0.75	0.88
0.68	0.49	0.05	0.43	0.95	0.58	0.19	0.36	0.69	0.87

Where critical value $Z_{0.25} = 1.96$, and $\alpha = 0.5$

Q2. Compute convolution sum of the following $X = [1\ 2\ 3\ 4]$ and $X = [1\ 1\ 1\ 1]$ **[03Marks, CO-03]**

Q3. Use the acceptance-rejection method to generate the random variates between 0.25 and 1 for the random sequence $R = [0.1, 0.4, 0.2, 0.3, 0.15, 0.5]$. **[03Marks, CO-03]**

Q4. The arrival rate of the customers at shop follows Poisson distribution with a mean 20 per hour. The service rate of the shop keeper also follows Poission distribution with a mean of 30 per hours. Compute the following parameter for the queuing model a shop. **[06 Marks, CO-04]**

(i) The probability of having zero customers in the shop.
(ii) The probability of having 8 customers in the shop
(iii) Average number of customers waiting in the shop
(iv) Average number of customers waiting in the queue
(v) Average waiting time in the queue
(vi) Average waiting time in the system

Q5. An observation of 5 fire crew response times (in min) to incoming alarms are recorded as given below: 2.76, 1.83, 0.80, 1.45, and 1.24. Generate the random variates from the above empirical response time distribution for the random numbers given as: 0.71 and 0.84.

[5 Marks, CO-05]

Q6. Compute the following parameters for a single server queuing system when inter-arrival time and service times are given by the table below: **[6 Marks, CO-04]**

Customer	Inter-arrival Time	Service Time
1	-	3
2	3	2
3	1	1
4	3	3
5	2	2
6	4	3

(i) Average waiting time of customers (in minutes)
(ii) Probability that a customer has to wait in queue.
(iii) Probability of idle time of server
(iv) Average service time of customer (in minutes)
(v) Average time customer spends in the system
(vi) Average waiting time of customers those who wait

Q7. Explain the process of verification and validation of simulation models. Also, Differentiate between static physical models and dynamic physical models. Take suitable Example to illustrate the use of these models. **[6 Marks,CO-01]**