

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATIONS- 2022

B.Tech-IV Semester (CS/IT)

COURSE CODE (CREDITS): 18B11CI413

MAX.

MARKS: 35

COURSE NAME: Modeling and Simulation Techniques

COURSE INSTRUCTORS:

MAX. TIME: 2 Hours

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Note: All questions are compulsory. Marks are indicated against each question in square brackets.

Q1. Define linear congruential method for random number generation. Use this method to generate a sequence of random number where $Z_0 = 27, a = 13, c = 37$ and $m = 10$.

[05] [CO-2]

Q2. Apply the auto-correlation test for testing the independence of 3rd, 8th, 13th and so on for the following sequence of random numbers: 0.594, 0.928, 0.515, 0.055, 0.351, 0.262, 0.797, 0.442, 0.097, 0.798, 0.227, 0.127, 0.474, 0.825, 0.007, 0.185, 0.929, 0.852. Consider the level of significance $\alpha = 0.05$ and corresponding $|Z_{\alpha/2}| = 1.96$.

[05] [CO-3]

Q3. The PDF of a triangular distribution is given as:

$$f(x) = \begin{cases} x & \text{for } 0 \leq x \leq 1 \\ 2 - x & \text{for } 1 \leq x \leq 2 \end{cases}$$

Compute the random variates of the random numbers 0.54, 0.73, 0.98, 0.11 and 0.68 for the above distribution.

[05] [CO-2]

Q4. Define the performance measurement of single server queuing system. Compute the following performance parameters for a single server queuing system when inter-arrival time and service time are given by the following table:

[05] [CO-4]

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

- (i) Average waiting time of customers in the queue
- (ii) Average inter-arrival time of customers

- (iii) Probability of the server to be in idle mode
- (iv) Average service time of the server
- (v) Average waiting time of customers in the systems

Q 5. The arrival rate of the customers at a medical shop counter follow Poisson distribution with a mean of 45 per hour. The service rate of the shop keeper also follows the Poisson distribution with a mean of 60 per hour. Find the following parameters of this system. [07] [CO-4]

- (i) Service utilization factor
- (ii) Probability of having zero customers in the system
- (iii) Probability of having 2 customers in the system
- (iv) Average number of customers waiting in the queue
- (v) Average number of customers waiting in the system
- (vi) Average waiting time of customers in the system
- (vii) Average waiting time of customers in the queue

Q 6. Compute the exponential random variates X_i with mean $\lambda=2$ for the given random numbers; $R_i = \{0.12, 0.02, 0.51, 0.75, 0.7\}$. [05] [CO-5]

Q 7. Discuss verification, calibration and validation of simulation models for simple system [03] [CO-6]