CBCS SCHEME

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17CS834

Eighth Semester B.E. Degree Examination, July/August 2021
System Modeling and Simulation

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions.*

1 a. What are the advantages and disadvantages of simulating a system? **(10 Marks)**

b. A grocery store has one checkout counter. The interarrival time and service times are given in the table below. Prepare aimulation table with a stopping event at time 20 and show the checkout line and FEL. Calculate maximum queue length, average system time and utilization of the server.

Interarrival times	3	5	4	6	2	7
Service time	5	2	7	4	3	5

(10 Marks)

2 a. Simulate a single server queueing system for 10 customers and find (i) Average waiting time (ii) Probability that a customer has to wait (iii) Average service time (iv) Server Utilization (v) Average time a customer spends in the system. The probability distributions of inter arrival time and service time are as given below.

Inter arrival time	Probability
1	0.3
3	0.4
5	0.3
Random numbers to be used : 9, 3, 2, 1, 0, 5, 8, 7, 4	

Service time	Probability
1	0.2
2	0.25
3	0.35
4	0.2
Random numbers to be used : 85, 10, 54, 76, 23, 12, 69, 06, 98, 35	

(10 Marks)

b. Write the event scheduling algorithm and illustrate the execution of arrival event and departure event in event scheduling approach using flowchart. **(10 Marks)**

3 a. 30% of the assembled ink-jet printers are rejected at the inspection station. Find the probability that the first acceptable ink-jet is the third one inspected considering each inspection as a Bernoulli trial. Also find the probability that the fifth printer inspected in the second acceptable printer. **(05 Marks)**

b. Explain the concepts of normal distribution. **(05 Marks)**

c. Explain the characteristics of queueing system. **(10 Marks)**

4 a. A computer repair person is beeped each time there is a call for service. The number of beeps per hour is known to occur in acordence with a Poisson distribution with a mean $\alpha = 3$ per hour. Find the (i) Probability of 3 beeps in the next hour (ii) Probability of two or more beeps in a 1-hour period (iii) Probability of number of beeps between 1 and 3. **(10 Marks)**

b. Explain the long-run measures of performance of queueing systems with an example. **(10 Marks)**

5 a. Explain the linear congruential generator and the rules for selecting the values of the parameters. Generate three random numbers given $X_0 = 37$, $a = 07$, $C = 29$, $m = 100$. **(10 Marks)**

b. Explain Acceptance-Rejection Technique using Poisson distribution. Generate three Poisson variates with mean $\alpha = 0.6$, Random numbers are 0.8311, 0.6437, 0.9963, 0.8582, 0.4321 and 0.5032. **(10 Marks)**

6 a. Test whether 3^{rd}, 7^{th}, 11^{th} and so on numbers are autocorrelated at $\alpha = 0.05$ in the following sequence $Z_{0.025} = -1.96$, 0.594, 0.928, 0.515, 0.055, 0.507, 0.351, 0.262, 0.797, 0.788, 0.442, 0.097, 0.798, 0.227, 0.127, 0.474, 0.825, 0.007, 0.182, 0.929, 0.852 **(10 Marks)**

b. Explain the procedure for inverse transform technique using exponential distribution. Given the random numbers 0.2414, 0.8210, 0.4756, 0.7354. Compute the exponential variates X_i with value of $\lambda = 2$. **(10 Marks)**

7 a. How do you estimate the parameters of the following distributions:
(i) Poisson distribution (ii) Exponential distribution (iii) Gamma distribution
(iv) Normal distribution (v) Lognormal distribution **(10 Marks)**

b. Highlight the features of types of simulations with respect to output analysis with examples for each. **(10 Marks)**

8 a. List the properties using physical basis of the distributions for any ten distributions. **(10 Marks)**

b. Which are the measures of performance of a simulated system? How do you estimate them? **(10 Marks)**

9 a. Define verification of simulation model and suggest techniques for verifying a simulation model. **(10 Marks)**

b. Explain model building verification and validation with respect to simulation models. **(10 Marks)**

10 a. Illustrate the calibration technique for simulation model. **(10 Marks)**

b. Explain Naylor and Finger 3-step approach to aid in the validation process. **(10 Marks)**

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