CBCS SCHEME

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17CS834

Eighth Semester B.E. Degree Examination, Jan./Feb. 2023
System Modelling and Simulation

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Assume data if necessary.

Module-1

1 a. With a neat flow chart explain the various steps in a simulation study. **(10 Marks)**

b. Discuss the advantages and disadvantages of simulation. **(10 Marks)**

OR

2 a. Define the following terms:
i) System ii) Model iii) System state iv) Entity v) Attributes vi) List vii) Event viii) Event notice ix) Activity x) Delay. **(10 Marks)**

b. A grocery store has one checkout counter. Customers arrive at this checkout counter at random from 1 to 8 minutes apart and each inter-arrival has the same probability of occurrences. The service times vary from 1 to 6 minutes with probability given below.

Service time	1	2	3	4	5	6
Probability	0.10	0.20	0.30	0.25	0.10	0.05

Develop a simulation table for 10 customers. Consider the random digits for arrivals as -, 64, 112, 678, 289, 871, 583, 139, 423, 39 and service times as 84, 18, 87, 81, 06, 91, 79, 09, 64, 38 in sequence.
Find :
i) Average waiting time of a customer
ii) Average service time
iii) Probability that a customer has to wait in the queue.
iv) Probability of idle time of the server. **(10 Marks)**

Module-2

3 a. Explain uniform distribution. **(10 Marks)**

b. Explain exponential distribution. **(10 Marks)**

OR

4 a. Explain queuing notation for parallel server systems. **(10 Marks)**

b. Discuss characteristics of queuing systems. **(10 Marks)**

Module-3

5 a. The sequence of numbers
0.44, 0.81, 0.14, 0.05, 0.93 has been generated. Use the Kolmogorov-Smirnov test with $\alpha = 0.05$ to learn whether the hypothesis that the numbers are uniformly distributed on the interval [0, 1] can be rejected. [$D_\alpha = 0.565$]. **(10 Marks)**

b. Generate five random numbers by linear congruential method with
$X_0 = 27$, $a = 17$, $c = 43$ and $m = 100$. **(10 Marks)**

OR

6 a. Suggest step by step procedure to generate random variates using inverse transform technique for exponential distribution. **(08 Marks)**

b. Generate three poisson variates with mean $\alpha = 0.2$, $e^{-\alpha} = e^{-0.2} = 0.8187$. **(12 Marks)**

Module-4

7 a. Discuss suggested estimators for distributions often used in simulation. **(08 Marks)**

b. Discuss four steps in the development of a useful model of input data. **(04 Marks)**

c. Discuss various ways of obtaining information about a process even if data are not available. **(08 Marks)**

OR

8 a. Discuss measures of performance and their estimation. **(10 Marks)**

b. Discuss types of simulations with respect to output analysis. **(05 Marks)**

c. Discuss stochastic nature of output data. **(05 Marks)**

Module-5

9 a. Explain Initialization Bias in steady-state simulations and error estimation for steady-state simulations. **(10 Marks)**

b. Discuss replication method for steady-state simulations and batch means for interval estimation in steady-state simulations. **(10 Marks)**

OR

10 a. Explain with neat diagram, model building, verification and validation. **(10 Marks)**

b. Explain three step approach for validation process as formulated by Naylor and Finger. **(10 Marks)**

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