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13MCA52

Fifth Semester MCA Degree Examination, Aug./Sept.2020
System Simulation and Modeling

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions.

- 1 a. What is Simulation? When it is an appropriate tool? When it not? (10 Marks)
 b. With a neat flowchart, explain the steps in simulation study. (10 Marks)

- 2 a. Define discrete and continuous random variable. Explain any 3 continuous random variables. (10 Marks)
 b. A production process manufactures alternators for outboard engines used in recreational boating. On an average, 1% of the alternators will not perform up to the required standards when tested at the engine assembly plant. When shipment of 100 alternators is received at the plant, they are tested, and if more than two are non confirming the shipment is returned to the alternators manufactures. What is the probability of returning a shipment? (10 Marks)

- 3 a. Explain linear congruential method to generate random numbers and generate a sequence of RNs with $X_0 = 27$, $a = 17$, $c = 43$ and $m = 100$. (06 Marks)
 b. Bring out the steps in K-S test (Kolmogoror-Smirnov Test) to test the uniformity of the random numbers. (04 Marks)
 c. Test for whether the 3rd, 8th, 13th and so numbers in the sequence given below are autocorrelated using $\alpha = 0.05$ ($Z_{0.025} = 1.96$)
 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 (10 Marks)

- 4 a. Explain the characteristics of Queuing model. (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 time has the same probability of occurrence. The service time with probabilities as given below

ST (minutes)	1	2	3	4	5	6
Probability	0.10	0.20	0.30	0.25	0.10	0.05

Simulate the arrival of 5 customers and assume that first customer arrives at 0 minutes.

Calculate the following:

- i) Average waiting time for a customer
- ii) Probability that a customer has to wait
- iii) Probability of a server being idle
- iv) Average service time
- v) Average time between arrivals.

RD for IAT : 913, 727, 015, 948

RD for ST : 84, 10, 74, 53, 17, 79

(10 Marks)

- 5 a. Explain the event scheduling algorithm with suitable system snapshots. (08 Marks)
- b. Six dump trucks are used to haul coal from the entrance of a mine to railroad. Each truck is loaded by one of two loaders. After loading, a truck immediately moves to the scale, to be weighed as soon as possible. Both the loaders and the scale have a first-come first-served waiting line for trucks. Travel time from a loader to scale is negligible. After being weighed a truck begins travel time (during which time truck unloaded) and the afterward returns to the loader queue. The activities of loading time, weighing time and travel time are given below:

Loading Time	10	5	5	10	15	10	10
Weighing Time	12	12	12	16	12	16	
Travel Time	60	100	40	40	80		

Depict the simulation table and estimate the loader and scale utilization. Assume that five of the trucks are at the loaders and one is at the scale at time '0'. Simulate till to clock reaches 20 minutes. (12 Marks)

- 6 a. When to use Random variate generation? Explain the inverse-transformation technique to obtain random variates for exponential, uniform and triangular distributions. (10 Marks)
- b. Explain the methods for selecting families of input distributions when data are available. (10 Marks)
- 7 a. Explain with a neat diagram, model building verification and validation process. (10 Marks)
- b. Describe the 3-steps approach to validation by Naylor and Finger. (10 Marks)
- 8 a. Briefly explain the measure of performance of a simulation system. (10 Marks)
- b. Explain the terminating or transient simulation and steady state simulation. Give example. (10 Marks)

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