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10CS82

Eighth Semester B.E. Degree Examination, Dec.2019/Jan.2020
System Modeling and Simulation

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. What is simulation? State any three merits and demerits. **(05 Marks)**

b. Differentiate between continuous and discrete system. **(05 Marks)**

c. A grocery store has one checkout counter. Customers arrive at this checkout counter at random from 1 to 8 minutes apart and each interval time as the same probability of occurance. The service times vary from 1 to 6 minutes, with probability given below:

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

Simulate the arrival of six customers and 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 arrival.

Use the following sequence of random numbers:
Random digit for arrival : 913, 727, 015, 948, 309, 922
Random digit for service time : 84, 10, 74, 53, 17 **(10 Marks)**

2 a. Briefly define any four concepts used in discrete event simulation. **(04 Marks)**

b. Generating system snapshots at clock = t and clock = H, explain event scheduling algorithm. **(06 Marks)**

c. Suppose the maximum inventory level M is 11 units and the review period N, is 5 days. Estimate by simulation the average ending units in inventory and number of days when a shortage condition occurs. The number of units demanded per day is given by the following distributions. Assume that orders are placed at the close of the business and are received for inventory at the beginning of business as determined by lead time. Initially simulation started with 3 units and order of 8 units scheduled to arrive in 2 days of time.

Demand	0	1	2	3	4
Probability	0.10	0.25	0.35	0.21	0.09

Lead time is a random variable, with the following probability distribution:

Lead time (days)	1	2	3
Probability	0.6	0.3	0.1

Random digits for demand : 24, 35, 65, 81, 54, 03, 87, 27, 73, 70, 47, 45, 48, 17, 09
Random digit for lead time : 5, 0, 3 order quantity 9, 11. Simulate for 3 cycles. **(10 Marks)**

3 a. Differentiate between continuous and uniform distributions. **(10 Marks)**

b. Briefly explain Poission process. **(10 Marks)**

4 a. Explain the characteristics of a queuing system. List different queuing notations. **(10 Marks)**

b. Suppose that the inter arrival times and service times at a single chair unisex-hair-styling shop have been shown to be exponentially distributed the values of X and μ are 2 per hour and 3 per hour respectively that is, the time between arrivals averages ½ hr, exponentially distributed and the service time averages 20 minutes, also exponentially distributed. How server utilization and the probabilities for zero, one, two, three and four or more customers in the shop are computed? **(10 Marks)**

PART – B

5 a. What are pseudo random numbers? What are the problems that occur while generating pseudo random numbers? **(06 Marks)**

b. Generate 6 three digit random numbers using multiplicative congruential method with $X_0 = 117$, a = 43 and M = 1000. **(06 Marks)**

c. Five observations of fire-crew response times to incoming alarms have been collected to be used in a simulation investigating possible alternative staffing and crew scheduling policies. The data are 2.76, 1.83, 0.80, 1.45, 1.24
Develop a preliminary simulation model that uses a response time distribution for five observations. Thus a method for generating random variates from the response time distribution is needed. Initially response time X have a range $0 \le X \le C$. If a random number $R_1 = 0.71$. How it can be represented in graphical view as in Emprical cdf. **(08 Marks)**

6 a. Explain the need for input modeling and histogram method of identifying the input distribution. **(06 Marks)**

b. How chi-square test can be derived from goodness-of-fit test? **(04 Marks)**

c. Briefly explain time-series input models. **(10 Marks)**

7 a. Explain stochastic nature of output data along with measure of performance and their estimation. **(10 Marks)**

b. How the output analysis applied for steady state simulation? Explain any one output analysis. **(10 Marks)**

8 a. How model can be build, perform verification and validation? Explain with diagram. **(10 Marks)**

b. Briefly explain the validation of input out transformation of the model and the various techniques used. **(10 Marks)**

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