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15CS834

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

Time: 3 hrs.

Max. Marks: 80

Note: *Answer FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. What is Simulation? Explain with flowchart the steps involved in simulation study.

(10 Marks)

   b. A supermarket has only one checkout counter. Customer arrives at this checkout counter at random from 1 to 5 minutes apart with equal probability. The service time varies from 1 to 6 minutes with probability 0.30, 0.25, 0.05, .10, 0.10 and 0.20. Develop a simulation table for 10 customers and find the following :
   i) Average service time
   ii) Average time between arrivals
   Use the following sets of random numbers for arrivals 84, 10, 74, 53, 17, 79, 03, 87, 27. Random digit for service time 23, 35, 65, 81, 54, 03, 87, 27, 73, 70. **(06 Marks)**

OR

2 a. Explain the various concepts used in discrete event simulation with an example. **(08 Marks)**

   b. Explain event – scheduling algorithm by illustrating old system snapshot and new system snapshot. **(08 Marks)**

Module-2

3 a. Explain the following discrete distribution.
   i) Binomial distribution
   ii) Poisson distribution. **(08 Marks)**

   b. Explain the following continuous distribution.
   i) Uniform distribution
   ii) Exponential distribution. **(08 Marks)**

OR

4 a. What are the characteristics of queuing systems? Explain with a neat diagram. **(08 Marks)**

   b. Explain steady state parameters of M/G/1 queue. **(08 Marks)**

Module-3

5 a. What is a Random number? What are the different properties of a Random number? When a Random number is called pseudo – random number? Explain. **(08 Marks)**

   b. The sequence of numbers 0.54, 0.73, 0.98, 0.11, 0.08 has been generated. Use Kolmogorov Smirnov test with $\alpha = 0.05$ to determine if the hypothesis that the numbers are uniformly distributed on the interval [0, 1] can be rejected. Compare $F(x)$ and $S_N(X)$ on a graph. $D_{0.05} = 0.565$. **(08 Marks)**

OR

6 a. Explain the inverse transform technique for exponential distribution and uniform distribution. **(08 Marks)**

   b. What is Acceptance – Rejection technique? Generate 3 Poisson variates with mean $\alpha = 0.2$. Take the random numbers as :
   0.4357, 0.4146, 0.8353, 0.9952, 0.8004, 0.7945. **(08 Marks)**

Module-4

7 a. Explain the steps involved in development of a useful model of input data. **(08 Marks)**

   b. Customers arriving at a busy checkout counter in a 5 minutes period between 10 to 2 pm was recorded for days given below :

Arrival/period	0	1	2	3	4	5	6	7	8	9	10	11
Frequency	12	10	19	17	10	8	7	5	5	3	3	1

   Use chi – square test to check whether the data follows Poisson distribution at 5% level of significance, $\chi^2_{0.05,5} = 11.1$. **(08 Marks)**

OR

8 a. The time required for 30 different employs to compute and record the number of hours worked during week days given :

1.88	2.62	1.49	0.35	0.82	2.03	1.54	0.21
0.39	2.03	2.16	0.90	1.90	0.63	0.17	0.03
0.45	0.31	0.15	2.03	4.29	0.04	1.73	0.92
2.81	0.05	5.5	2.16	0.48	0.18		

   Use the chi-square to test the hypothesis that these service times are exponentially distributed at 5% of level of significance. Let the number of intervals be K = 6 and critical value 9.49. **(08 Marks)**

   b. Explain the types of simulation with respect to output analysis. Give atleast two example. **(08 Marks)**

Module-5

9 a. Explain the concepts of point estimation and interval estimation. **(08 Marks)**

   b. Explain any two output analysis for steady state simulation. **(08 Marks)**

OR

10 a. What is verification and validation? With a neat diagram explain in detail model building. **(08 Marks)**

   b. With a neat diagram, explain iterative process of calibrating a model. **(08 Marks)**

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