10CS82

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 is Simulation? List any four circumstances when the simulation is appropriate tool and when it is not. **(10 Marks)**

b. 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. Initial simulation started with inventory level of 3 units and an order of 8 units scheduled to arrive in two days of time. Simulate for 3 cycles (15 days). The probability of daily demand and lead time is given in table: **(10 Marks)**

Daily demand	0	1	2	3	4
Probability	0.10	0.25	0.35	0.20	0.10

Lead time (days)	1	2	3
Probability	0.5	0.3	0.2

Random digit for demand	24	35	65	25	8	85	77	68	28	5	92	55	49	69	70
Random digit for lead time	5	0	3												

2 a. Explain the major concepts of discrete event simulation with an example. **(10 Marks)**

b. Prepare a simulation table for a single channel queuing system using event scheduling/time advance algorithm, until the clock reaches 21, using the Inter-Arrival Time (IAT) and Service Time (ST) given below in the order shown.

IAT	8	6	1	8	3	8
S.T.	4	1	4	3	2	4

Compute: i) Total busy time of server ii) Maximum queue length. **(07 Marks)**

c. Explain three phases of activity scanning approach. **(03 Marks)**

3 a. Explain: i) Binomial distribution ii) Exponential distribution. **(08 Marks)**

b. A bus arrives every 20 minutes at a specified stop beginning at 6:40 A.M, and continuing until 8:40A.M. A certain passenger does not know the schedule, but arrives randomly (uniformly distributed) between 7.00A.M. and 7:30A.M. every morning. What is the probability that the passenger waits more than 5 minutes for a bus? **(06 Marks)**

c. Briefly explain the properties of Poisson process with example. **(06 Marks)**

4 a. Explain the characteristics of queuing system. List the different queuing notations for parallel server systems. **(12 Marks)**

b. What is network of queue? Mention the general assumption for a stable system with infinite calling population. **(08 Marks)**

5 a. What are pseudo random numbers? Use linear congruential method to generate a sequence of 5 two digit random numbers with given seed 45, constant multiplier 21, increment 49 and modulus 40. **(06 Marks)**

    b. The sequence of random numbers 0.44, 0.81, 0.14, 0.05 and 0.93 has been generated. Use Kolomogorov – Simrnov test with 5% significance level, to determine if the hypothesis that the numbers are uniformly distributed on the interval (0, 1) can be rejected. [N = 5, $D_{0.05,5}$ = 0.565] **(06 Marks)**

    c. Explain inverse transform technique of producing random variates for   i) Exponential distribution   ii) Triangular distribution. **(08 Marks)**

6 a. Records pertaining to the monthly number of job related injuries at an underground coal mine were being studied by a federal agency. The values for the past 100 months were as follows:

Injuries per month	0	1	2	3	4	5	6
Frequency of occurrence	35	40	13	6	4	1	1

    Apply chi-square goodness of fit test to these data to test the hypothesis that the underlying distribution is Poisson. Use the level of significance $\alpha = 0.05$, Take $\chi^2_{0.05,2} = 5.99$. **(08 Marks)**

    b. Explain data collection in input modeling. **(06 Marks)**

    c. List the different families of probability distribution used with specific physical process in order to select for simulation. **(06 Marks)**

7 a. What is output analysis? Explain terminating and steady state simulation with example. **(10 Marks)**

    b. Briefly explain point estimation and confidence-interval estimation with example. **(10 Marks)**

8 a. What is verification? Explain the suggestions given for use in verification process. **(10 Marks)**

    b. Describe the three step approach to validation by Naylor and Finger. **(10 Marks)**

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