CBCS SCHEME

Eighth Semester B.E. Degree Examination, November 2020
System Modeling and Simulation

Time: 3 hrs.   Max. Marks: 80

Note: Answer any FIVE full questions irrespective of modules.

Module-1

1 a. List any four circumstances, when the simulation is the appropriate tool and when it is not. **(08 Marks)**

  b. Consider the grocery store with one check out counter. Prepare the simulation table for 8 customers and find out average waiting time of customer in queue, idle time of server and average service time. The inter arrival time and service time are given in minutes. **(08 Marks)**

Inter arrival time (IAT) :	3, 2, 6, 4, 4, 5, 8
Service time (ST) :	3, 5, 5, 8, 4, 6, 2, 3

2 a. Define : (i) System   (ii) Event   (iii) FEL (Future Event List) **(03 Marks)**

  b. Explain different types of world views. **(06 Marks)**

  c. Six dump trucks are used to haul coal from the entrance of a small mine to the rail road. Each truck is loaded by one of two loaders. After loading, truck immediately moves to the scale to be weighed. Loader and scale have First-Come-First-Serve (FCFS) queue. The travel time from loader to scale is negligible. After being weighed, a truck begins a travel time, afterwards unload the coal and returns to the loader queue. It is assumed that Five trucks are at the loader and one is at the scale at time = 0. Carryout simulation process till the completion of two weighing from the scale. The activities of loading, weighing and travel time are given in the following table:

Loading time	10	5	5	10	15	10	19
Weighing time	12	12	12	16	12	16	
Travel time	60	100	40	40	80		

Calculate : (i) The busy time of both the loaders and scale.
                 (ii) Average loader and scale utilization. **(07 Marks)**

Module-2

3 a. Explain (i) Exponential distribution   (ii) Binomial distribution. **(06 Marks)**

  b. With example explain the properties of Poisson process. **(06 Marks)**

  c. The time to failure of a battery is Weibull-distributed with location parameter = 0, $\alpha = \dfrac{1}{2}$ years and $\beta = \dfrac{1}{4}$. What fraction of batteries are expected to last longer than the mean life? **(04 Marks)**

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

  b. What is network of queue? Mention the general assumption for a stable system with infinite calling population. **(06 Marks)**

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Module-3

5 a. What are the problems that occur while generating pseudo-random numbers? Also list the important considerations during generation of random numbers. **(08 Marks)**

   b. Consider the sequence of random numbers 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. Test whether 3rd, 8th, 13th and so on numbers in the above sequence are auto-corrected. At significance level $\alpha = 0.05$, Normal critical table value is given as 1.96 **(08 Marks)**

6 a. Explain inverse transform technique for, (i) Exponential distribution   (ii) Triangular 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. Apply chi-square goodness of fit test to Poisson assumption with mean $\alpha = 3.64$.
   Data size = 100 and observed frequency $O_i = 12, 10, 19, 17, 10, 8, 7, 5, 5, 3, 3, 1$ and $\chi^2_{0.05,5} = 11.1$ **(08 Marks)**

8 a. List and explain the different ways to obtain information about a process even if data are not available. **(06 Marks)**

   b. Briefly explain the types of simulation with respect to output analysis. Give examples. **(06 Marks)**

   c. Write a short note on point estimation. **(04 Marks)**

Module-5

9 a. Explain output analysis for steady state simulation. **(08 Marks)**

   b. Explain the suggestions given for use in verification process. **(08 Marks)**

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

   b. Explain 3-step approach for validation process as formulated by Naylor and Finger. **(08 Marks)**

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