



System Dynamics & Simulation
(1070)

P. Pages : 3

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
 2. Answer sheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
 3. Students should note, no supplement will be provided.
 4. Answer **any five** questions.
 5. Neat diagram must be drawn wherever necessary.
 6. Figures to right indicate full marks.
 7. Use of electronic pocket calculator is allowed.
 8. Assume suitable data, if necessary.
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1. a) Describe the behavior of dynamic systems with the help of suitable example. **20**
b) Describe with the help of suitable example, system behavior and causal loop Diagrams.
 2. a) What is an exponential distribution ? Explain with an example. **20**
b) Discuss the discrete probability function. How it is different from continuous probability function ?
 3. a) What is simulation ? Describe the simulation process. **20**
What are the reasons for using simulation ?
b) Explain at least five illustrations showing the applications of Monte Carlo method.
 4. a) What is discrete simulation ? Explain with the help of suitable example. **20**
b) Explain weibull distribution and its role in simulation of component failures.

5. a) Is Poisson's arrival pattern for queuing is valid for all types of queues ? Explain with an example. **20**
- b) Write a short note on M/Ek/1 models and their applications.
6. a) Consider a manufacturing line with four stations. Demonstrate that it is a queuing system by describing its components. **20**
- b) Identify the customers and the servers in the queuing system in each of the following situations.
- The checkout stand in a grocery store.
 - A fire station
 - The toll booth for a bridge.
 - A bicycle repair shop.
 - A shipping dock.
7. a) Give a general structure of the queuing system and explain it. **20**
Prove that if the number of arrivals follows Poisson process, then the inter - arrival times follow the exponential distribution.
- b) At a small store of ready made garments, there is one clerk at the counter who is to check the bills, receive payments and place the packed garments into fancy bags, etc. The customers' arrival at the check counter is a random phenomenon and the time between the arrivals varies from one minute to five minutes, the frequency distribution for which is given in table. The service time (time taken by the counter clerk) varies from one minute to three minutes. The manager the store feels that the counter clerk is not sufficiently loaded with work and wants to assign to him some additional work, But before taking the decision he likes to know precisely by what percentage of time the counter clerk is idle.
Frequency distribution of inter - arrival times.

Time between Arrivals (minutes)	1	2	3	4	5
Frequency %	35	25	20	12	8

Frequency distribution of service times.

Service time (Minutes)	1	1.5	2	2.5	3
Frequency %	20	35	25	15	5

Assume following Random numbers for arrivals :

48, 51, 6, 22, 79, 56, 6, 91, 51, 13, 65, 59, 51, 50, 13, 94, 57, 26, 78, 33.

Assume following Random numbers for service time :

22, 62, 25, 31, 23, 7, 93, 44, 12, 26, 93, 1, 17, 49, 58, 98, 61, 41, 13, 59.

Carry out twenty iterations using monte - carlo technique and find out Counter clerk's idle time (min.) & Customer's waiting time (min).

8. a) The demand for a particular item has the probability distribution shown below :

Dailydemand(units)	4	5	6	7	8	9	10	11	12
Probability	0.06	0.14	0.18	0.17	0.16	0.12	0.08	0.06	0.03

If the lead time is 5 days, using simulation study the implications of inventory policy of ordering 50 units wherever the inventory at the end of the day is 40 units. Assume the initial stock level of 75 units and run the simulation for 10 days.

- b) Formulate the problem given in Q. 7 (b) so as to solve the same by using any of the simulation software.
Discuss the parameters and their values that are required to be set in the software.
Explain the steps to be followed so as it can be solved by using the software.

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