Seat No. | | | | | | |

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मासला - 005

System Dynamics & Simulation
(1070)

P. Pages : 2

Time : Three Hours **Max. Marks : 100**

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answersheet 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.

1. a) Classify different types of models of a system with suitable example. **20**

b) Differentiate between modeling and simulation.

2. a) What is an exponential distribution ? Explain with an example. **20**

b) Name several entities, attributes, activities for the following systems.

- A barber shop.
- A cafeteria.
- A grocery shop.
- A fast food restaurant.
- A petrol pump.

3. a) Define simulation. "When it becomes difficult to use an optimization technique for solving a problem, one has to resort to simulation." Discuss. **20**

b) Explain at least five illustrations showing the applications of Monte Carlo method.

4. a) What is continuous simulation ? Explain with the help of suitable example. **20**

b) Explain Normal 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/M/c models and their applications.

6. a) Give some application of queueing theory and explain the following terms clearly.
i) queue length ii) traffic intensity iii) service channels
iv steady and transient state v) queue discipline **20**

b) Identify the customers and the servers in the queueing system in each of the following situations :
a) The checkout stand in a grocery store.
b) A fire station.
c) The toll booth for a bridge.
d) A bicycle repair shop.
e) A shipping dock.

7. a) The mean arrival rate to a service centre is 3/hr. the mean service time is found to be 10 minutes per service. Assume Poisson arrival and exponential service time find.
a) Utilization factor for the service facility.
b) Probability of 2 units in the system.
c) expected number of units in the queue.
d) expected time in minutes that a customer has to spend in the system. **20**

b) A bank has two counters for withdrawals. One counter handles withdrawals of value less than Rs. 1,000 and the other counter Rs. 1,000 and above, Analysis of service time shows an exponential distribution with mean service time of 6 minutes per customer for each counter. Arrival of customers follows Poisson distribution with mean 8 per hour for the first counter and 5 per hour for the second counter.
What are the average waiting times per customer of each counter ?
If each counter could handle all withdrawals irrespective of their value, how would the average waiting time change ? Explain the model which you have used.

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

Daily demand (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 whenever 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. **20**

b) Project arrives every 20 minutes at Desig_Queue (Capacity : 100), spend 30 minutes in Design, 15 minutes in Design_Review. Not all drawings pass the Review. 10% head to Rework, Rework will take 15 minutes per Project and then back to Design_Review while remaining 90% continue to Produce_Drawings that takes 20 minutes and then Exit the system.
Formulate the problem 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 that it can be solved by using the software.

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