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Eighth Semester B.E. Degree Examination, June/July 2019
System Modeling and Simulation

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting
atleast TWO questions from each part.**

PART – A

- 1 a. What is simulation? Explain the steps involved in simulation study along with flowchart. (10 Marks)
- b. A grocery store has one checkout counter. Customers arrive at the checkout counter at random from 1 to 8 minutes apart and each inter-arrival time has the same probability of occurrence. The service times vary from 1 to 6 minutes, with probability given below.

Service (minutes)	1	2	3	4	5	6
Probability	0.10	0.20	0.30	0.25	0.10	0.05

Simulate the arrival of 6 customers and calculate

- Average waiting time of customer
- Probability that a customer has to wait
- Probability of a server being Idle
- Average service time.

Use the following sequence of random numbers.

Random digit for Arrival	913	727	015	948	309	922
Random digit for service time	84	10	74	53	17	79

Assume that the first customer arrives at time 0. Depict the simulation in a tabular form.

(10 Marks)

- 2 a. Explain event scheduling algorithm by generating system snapshots at clock = t and clock = t_j. (05 Marks)
- b. What is world view? Explain three phases of activity scanning approach. (05 Marks)
- c. Six dump trucks are used to have coal from the entrance of a mine to a rail road. Each truck is loaded by one of the two loaders. After loading, truck immediately moves to the scale, to be weighed as soon as possible. Both the loaders and scale have first-come first-served waiting line for trucks. Travel time from a loader to scale is considered negligible. After being weighed, a truck begins travel time (during which time truck unloads) and then afterwards return to loader queue. The activities of loading, weighing and travel time are given in the following table.

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

Depict the simulation table and estimate the loader and scale utilization. Assume 5 trucks at loaders and one is at the scale, at time '0' stopping time T_E = 52 min. (10 Marks)

- 3 a. Define the following terms:
 (i) Discrete random variable
 (ii) Continuous random variable
 (iii) Cumulative Distribution function (06 Marks)
 b. Explain Poisson Distribution (04 Marks)
 c. Define continuous distribution and explain uniform distribution, exponential distribution and normal distribution. (10 Marks)
- 4 a. List out the characteristics of queuing system and explain the following :
 (i) Queue behaviour and queue discipline
 (ii) Service time and service mechanism (10 Marks)
 b. Explain the Queuing Notations (05 Marks)
 c. Write a note on Networks of queues (05 Marks)

PART – B

- 5 a. Generate the Random numbers for these values with seed = 37, constant multiplier = 7, Increment 29 and modulus = 100. (08 Marks)
 b. Differentiate between Chi-square and Kolmogrov-Smirnov test. (04 Marks)
 c. Using X_0^2 test, test for hypothesis that the data given follows uniform distribution at $\alpha = 0.05$ the critical value is 16.9

O_i	8	8	10	9	12	8	10	14	10	11
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(08 Marks)

- 6 a. Explain in detail the inverse transform technique for exponential distribution. (10 Marks)
 b. List the steps involved in the development of a useful model of input data. (04 Marks)
 c. Explain how the method of histogram can be used to identify the shape of distribution. (06 Marks)
- 7 a. Briefly explain the measures of performance of a simulation system. (10 Marks)
 b. Explain the distinction between terminating (or) transient simulation and steady state simulation. Give examples. (10 Marks)
- 8 a. Explain with a neat diagram, model building verification and validation process. (10 Marks)
 b. Describe the 3 steps approach to validation by Naylor and Finger. (10 Marks)

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