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Eighth Semester B.E. Degree Examination, Dec.2016/Jan.2017
System Modeling and Simulation

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1 a. A grocery store has one checkout counter. Customers arrive at this checkout counter at random 1 to 10 minute apart. Each inter arrival times has the same probability of occurrence. The service times vary from 1 to 6 minutes. Assume that 1st customer arrive at time 0.

Time between arrivals	1	2	3	4	5	6	7	8	9	10
Probability	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

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

Random digits for arrivals	-	72	15	94	39
Random digits for service time	84	10	74	53	17

Simulate the arrival of 5 customers and calculate the:

- i) Average waiting time of customers.
- ii) Probability of a customer has to wait.
- iii) Probability of server being Idle.

Depict the simulation in a tabular form. (10 Marks)

- b. With a neat flow chart explain in detail about the steps in simulation study. (10 Marks)

- 2 a. Explain event scheduling / time advance algorithm with an example. (08 Marks)

- b. 6 dump trucks are used to haul coal from the entrance of a small mine to rail road. Each track is loaded by one of 2 loaders. After loading, the truck immediately moves to the scale, to be weighed as soon as possible. Both the loaders and the scale have a FCFS waiting line for trucks. Travel time from a loader to the scale is considered negligible. After being weighed, a truck begins a travel and then afterward returns to the loader queue. The distribution of loading time, weighing time and travel time are given below. Estimate the loader and scale utilization. Assume 5 trucks are at the loader and one is at the scale, at time '0' stopping time $T_E = 64$ min. (12 Marks)

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

- 3 a. i) What is a system? Explain the various components of simulation with an example. (10 Marks)
 ii) Explain the flow diagram for the execution of the arrival and departure events. (10 Marks)

- b. Prepare a simulation table using time advance algorithm for a single channel queue. Stopping event will be at 30 min. Interarrival time and service times are given below. Find the busy time of server and maximum queue length (MQ). (10 Marks)

IA Time	8	6	1	8	3	8	7
ST	4	1	4	3	2	4	5

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

- 4 a. Explain the different characteristics of queuing systems. (10 Marks)
b. List the different queuing notations used in the queuing systems. (05 Marks)
c. Two workers competing for a job. Able claims an average service time is faster than Baker's, but Baker claims to be more consistent, even if not as fast. The arrival occurs according to a Poisson process at the rate $\lambda = 2/\text{hr}$. Able service statistics are an average service time of 24 minutes with a standard deviation of 20 minutes. Baker's service statistics are an average service time of 25 minutes, but a standard deviation of only 2 minutes. If the average length of the queue is the criterion of hiring, which worker should be hired? (05 Marks)

PART – B

- 5 a. Discuss different types of continuous distributions. (10 Marks)
b. A production process manufactures computer chips on the average at 2% non conforming. Everyday, a random sample of size 50 is taken from the process. If the sample contains more than two non conforming chips, the process will be stopped. Compute the probability that the process is stopped by the sampling scheme. (10 Marks)
- 6 a. Discuss different techniques used for generating random numbers. (10 Marks)
b. Explain frequency test and discuss the two different methods (tests) used for testing uniformity property in frequency test. (10 Marks)
- 7 a. Explain different steps in the development of useful model of input data with example. (10 Marks)
b. i) Explain different ways to obtain information about a process even if data are not available.
ii) List different suggested estimates for distribution used in simulation. (10 Marks)
- 8 a. Explain with a neat diagram model building and verification and validation process. (10 Marks)
b. Describe the 3 steps approach to validation by Naylor and finger. (10 Marks)

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