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10CS82

Eighth Semester B.E. Degree Examination, June/July 2014
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. Define system. Explain the components of a system with an example. **(10 Marks)**

b. With a neat flow diagram, explain the steps in simulation study. **(10 Marks)**

2 a. Describe queuing system with respect to arrival and service mechanisms, system capacity, queue discipline, flow diagrams of arrival and departure events. **(10 Marks)**

b. A small shop has one check out counter. Customers arrive at this checkout counter at random from 1 to 10 minutes apart. Each possible value of inter-arrival time has the same probability of occurrence equal to 0.10. Service times vary from 1 to 6 minutes with probability shown below:

Service time	1	2	3	4	5	6
Probability	0.05	0.10	0.20	0.030	0.25	0.10

Develop simulation table for 10 customers. Find: i) Average waiting time; ii) Average service time; iii) Average time, customer spends in system.
Take the random digits for arrivals as 91, 72, 15, 94, 30, 92, 75, 23, 30 and for service times are 84, 10, 74, 53, 17, 79, 91, 67, 89, 38 sequentially. **(10 Marks)**

3 a. Explain the event scheduling/time advance algorithm with an example. **(08 Marks)**

b. A company uses 6 trucks to haul manganese are from Kolar to industry. There are two loaders, to load each truck. After loading, a truck moves to the weighing scale to be weighed. The queue discipline is FIFO. When it is weighed, a truck travels to the industry and returns to the loader queue. The distribution of loading time, weighing time and travel time are as follows:

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

Calculate the total busy time of both loaders, the scale, average loader and scale utilization. Assume 5 trucks are at the loader and one is at the scale, at time "0". Stopping event time TE = 64min. **(12 Marks)**

4 a. Explain the following continuous distributions:
i) Uniform distribution
ii) Exponential distributions. **(10 Marks)**

b. Explain the characteristics of queuing system. List the different queuing notations. **(10 Marks)**

PART – B

5 a. Explain linear congruential method. Write three ways of achieving maximal period. **(05 Marks)**

b. The sequence of random numbers 0.54, 0.73, 0.98, 0.11 and 0.68 has been generated. Use Kolmogorov-Smirnov test with $\alpha = 0.05$ to determine if the hypothesis that the numbers are uniformly distributed on the interval [0, 1] can be rejected. Take $D_\alpha = 0.565$. **(05 Marks)**

c. What is acceptance-rejection technique? Generate three Poisson variates with mean $\alpha = 0.2$. The random numbers are 0.4357, 0.4146, 0.8353, 0.9952, 0.8004, 0.7945, 0.1530. **(10 Marks)**

6 a. Explain different steps in the development of a useful model of input data. **(10 Marks)**

b. Explain Chi-square goodness of fit test. Apply it to Poisson assumption with alpha = 3.64, Data size = 100. Observed frequency O_i : 12 10 19 17 10 8 7 5.5 3 3 1. Take level of significance $\alpha = 0.05$. **(10 Marks)**

7 a. Explain the types of simulation with respect to output analysis. Give examples. **(07 Marks)**

b. Briefly explain the confidence-interval estimation method. **(07 Marks)**

c. Explain output analysis for termination simulation. **(06 Marks)**

8 a. Explain with neat diagram, model building verification and validation. **(10 Marks)**

b. Explain three step approach for validation process as formulated by Nayler and Finger. **(10 Marks)**

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