Fifth Semester MCA Degree Examination, June 2012
System Simulation and Modeling

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions.*

1 a. What is simulation? Where simulation is appropriate and when it is not appropriate? **(10 Marks)**

   b. What are the steps involved in the study of simulation? Explain any four of them. **(10 Marks)**

2 a. A small grocery store has only one checkout counter. Customers arrive at this checkout counter at random from 1 to 8 minutes apart. The service times vary from 1 to 6 minutes with different probabilities. Analyse the system by simulating the arrival and service of 10 customers. Find the average waiting time, average interarrival time, and proportions of custmers made to wait. Use the following randomly generated activity times.

Inter arrival time	–	8	6	1	8	3	8	7	2	3
Service time	4	1	4	3	2	4	5	4	5	3

   (10 Marks)

   b. A transport corporation operates 15 long distance buses each with one driver. The corporation has a policy of keeping three reserve drivers on call to replace those who report sick. If a driver is not available, the bus trip is cancelled. The probability distribution for the daily number of sick drivers is as follows.

No of Sick drivers	0	1	2	3	4	5	Random no's 25,48,89,25,99
Probability	0.17	0.25	0.23	0.15	0.10	0.10	47,08,76,21,57,77,54,96,02,73

   Simulate to determine utilization of reserve drivers and also the probability that at least one trip is cancelled because to driver is available. **(10 Marks)**

3 a. What is discrete event simulation? Briefly explain the concepts of discrete event simulation. **(10 Marks)**

   b. Explain boot strapping. List the steps involved in event scheduling algorithm. Write the format of a snapshot. **(10 Marks)**

4 a. What is the importance of random numbers? What are problems which can occur when generating pseudo – random numbers? Explain **(10 Marks)**

   b. Using an appropriate congruential method find the period of the generator for $a = 13$, $m = 64$ and $X_0 = 1.2$. Also find two longest possible cycles. **(10 Marks)**

5 a. How random variate generation occurs? What are the steps involved in generating random variates by inverse transform technique? Also find random variable of uniform distribution by inverse transform technique in [a,b]. **(10 Marks)**

   b. Test the auto correlation of the 3rd, 8th, 13th and so on for the following output. Use $\alpha = 0.05$

0.11	0.01	0.23	0.26	0.88	0.31	0.64	0.28
0.82	0.93	0.98	0.15	0.33	0.35	0.91	0.41
0.60	0.27	0.75	0.88	0.68	0.49	0.05	0.42
0.94	0.58	0.20	0.36	0.69	0.87		

   (10 Marks)

6 a. A sequence of 1000 four digit random numbers has been generated. Following are the combinations and frequencies.

Combination	Frequency
Four different digits	585
One pair	372
Two pairs	17
Three like digits	24
Four like digits	02

Based on the poker test, cheek whether numbers are independent. Given $X^2_{(0.05,4)} = 9.49$.

(10 Marks)

b. What are the steps involved is an input modeling? Explain briefly. **(10 Marks)**

7 a. The following data represent the twenty time gaps between customers buy and sell orders, in seconds: 1.95, 1.75, 1.58, 1.42, 1.28, 1.15, 1.04, 0.93, 0.84, 0.75, 0.68, 0.61, 11.98, 10.79, 9.71, 14.02, 12.62, 11.36, 10.22, 9.20. Develop an input model for this data. **(10 Marks)**

b. What is verification validation? Clearly distinguish between them. Why calibration is required? **(10 Marks)**

8 Write short notes on:
(i) World views on simulation
(ii) Q – Q Plot
(iii) Estimation
(iv) Finger– Naylor three step approach. **(20 Marks)**

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