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

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer any FIVE full questions.
2. Use of statistical tables permitted.

- 1 a. With a flow-chart, explain the steps in a simulation study. (10 Marks)
 b. When is simulation 'an appropriate tool' and when it is 'not an appropriate tool'? (10 Marks)
- 2 a. Using examples, explain the concepts in discrete-event simulation. (06 Marks)
 b. Write the steps of event-scheduling algorithm. (05 Marks)
 c. Explain 'world views' in detail. (09 Marks)
- 3 a. Explain discrete random variables and its probability distribution and continuous random variables and its probability distribution using suitable examples. (10 Marks)
 b. Test the auto correlation of the 3rd, 8th, 13th and so on for the following output use $\alpha = 5\%$ level of significance. (10 Marks)

0.23, 0.03, 0.23, 0.28, 0.89, 0.64, 0.31, 0.28, 0.93, 0.83
 0.99, 0.15, 0.33, 0.35, 0.91, 0.41, 0.60, 0.27, 0.75, 0.88
 0.68, 0.49, 0.43, 0.95, 0.58, 0.19, 0.36, 0.36, 0.69, 0.87

- 4 a. Explain the 'characteristics' of queuing system. What does the format A/B/C/N/K represent? (10 Marks)
 b. A small grocery store has only one checkout computer. Customers arrive at this checkout counter from 1 to 10 minutes apart. Each possible value of inter-arrival time has the same probability of occurrence. The service time has the following distributions:

<u>Service time</u>	<u>Probability</u>
3	0.20
5	0.35
6	0.20
8	0.25

Simulate the grocery store for 10 customers and find the average waiting time, average service time and average time customer spends in the system.

Given random numbers are 09, 24, 65, 81, 73, 94, 02, 47, 54, 89. (10 Marks)

- 5 a. Define random number and its property and explain K-S test also verify the following random numbers are uniformly distributed or not
 0.44, 0.81, 0.05, 0.93, 0.14 given that $D_\alpha = 0.565$. (10 Marks)
 b. Generate 3 Poisson variates with mean = 0.2. By inverse transform technique. (05 Marks)
 c. Use linear congruential method to generate a sequence of random numbers with $x_0 = 27$, $a = 17$, $c = 43$ and $m = 100$. (05 Marks)

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.

- 6 a. Define 'input model'. Give one example. Explain the steps in development of an useful model of input data. **(10 Marks)**
- b. The number of vehicles at some place in a 5-minute period between 7.00 am and 7.05 am was monitored for five working days over a 20-week period.

Arrivals per period	Frequency
0	12
1	10
2	19
3	17
4	10
5	8
6	7
7	5
8	5
9	3
10	3
11	1

Find the preliminary statistics, sample mean, sample variance and also find the Poisson distribution parameter, estimator Z . **(10 Marks)**

- 7 a. Explain transient and steady-state simulation with respect to output analysis with an example for each. **(10 Marks)**
- b. Describe briefly the measures of performance of simulation models. **(06 Marks)**
- c. Explain 'initialization bias' in steady state simulation. **(04 Marks)**
- 8 a. Differentiate between verification and validation of simulation models. Suggest the techniques which help in verification. **(10 Marks)**
- b. Explain the Naylor and finger 3-step approach to aid validation process. **(10 Marks)**

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