Fifth Semester MCA Degree Examination, December 2011
System Simulation and Modeling

Time: 3 hrs.   Max. Marks:100

Note: *1. Answer any FIVE full questions*
2. Use of cumulative normal distribution table is permitted.

1 a. Bring out the difference between: i) Static and dynamic model
       ii) Discrete and continuous model   iii) deterministic and stochastic system
       iv) Analytical and numerical solution.   **(06 Marks)**
   b. List any two entities, two attributes, two events and two activities in a college system.
                                                                        (04 Marks)
   c. Prepare a simulation table for a single channel queuing system, for ten customers. Use the
       inter arrival time and service time, given in the below table.

Inter arrival time (min)	8	6	1	8	3	8	4	3	5	3
Service time (min)	4	1	4	3	2	4	1	5	2	2

   Compute the cumulative statistics.   i) Server utilization   ii) Maximum queue length
   iii) Average waiting time of customer   iv) Average time the customer spends in system
   v) Average service time.   **(10 Marks)**

2 a. Write the event scheduling algorithm.   **(05 Marks)**
   b. Six dump trucks are used to haul coal from the entrance of a small mine to the rail road.
       Each truck is loaded by one of the two loaders. After loading, the truck immediately moves
       to the scale to be weighed. Loader and scale have a FCFS queue. The travel time from
       loader to scale is negligible. After being weighed, a truck begins a travel time, afterwards
       unloads the coal and returns to the loader queue. Purpose of study is to estimate the loader
       and scale utilization. It is assumed that 5 trucks are at the loader and one is at the scale at
       time 0. Simulate the process till the chock reads 20. The activity times are taken from the
       following list, as needed.   **(10 Marks)**

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

   c. Briefly explain simulation in GPSS.   **(05 Marks)**

3 a. What is the use of statistical models in simulation study?   **(04 Marks)**
   b. An industrial chemical that will retard the spread of fire in paint has been developed. The
       local sales representative has determined, form post experience that 48% of the sales calls
       will result in an order.   i) What is the probability that the first order will come on the fourth
       sales call of the day?   ii) If eight sales calls are mode in a day, what is the probability of
       receiving exactly six orders?   iii) If four sales calls are made before lunch, what is the
       probability that one or less results in an order?   **(06 Marks)**
   c. The life of an industrial lamp is exponentially distributed, with failure rate 1/3.
       i) Find the probability that the lamp will last longer than its mean life of 3000 hours.
       ii) Find the probability that lamp will last between 2000 and 3000 hours.
       iii) Find the probability that lamp will last for another 1000 hours. Give that it is operating
       after 2500 hours.   **(06 Marks)**
   d. The time required to load an ocean goring vessel is normally distributed with N (12, 4).
       i) Find the probability that the vessel will be loaded in less than 10 hours.
       ii) Find the probability that vessel loading time is between 10 and 12 hours.   **(04 Marks)**

4 a. Briefly explain the queuing notation A/B/C/N/K. Give two examples.   (06 Marks)
   b. Explain any two long – run measures of performance of queuing system.   (06 Marks)
   c. Explain any four characteristics of queuing system.   (08 Marks)

5 a. List five desirable properties of random numbers.   (05 Marks)
   b. Explain the K–S test for random numbers. Perform the K–s test for the generated numbers. 0.44, 0.81, 0.14, 0.05, 0.93. The critical value for N = 5, α = 0.05 is 0.565.   (10 Marks)
   c. What is the use of inverse transform technique? Apply the same to exponential distribution.   (05 Marks)

6 a. Explain any two methods to identify the distribution, for the given data. (10 Marks)
   b. The vehicle arrival data given below is found to follow Poisson distribution. Test this finding, using Chi – square test. Let α = 3.64, $\psi^2_{0.05,5}$ = 11.1   (10 Marks)

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

7 a. Explain the three step approache to validation process.   (10 Marks)
   b. Write a note on input – output transformation.   (05 Marks)
   c. Briefly explain the use of Turing test on input – output validation.   (05 Marks)

8 a. Explain the two methods of estimating measures of performance.   (10 Marks)
   b. Give an example for terminating simulation and steady – state simulation each.   (04 Marks)
   c. Write a small note an initialization bias in steady – state simulation.   (06 Marks)

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