Eighth Semester B.E. Degree Examination, December 2011

System Modeling and Simulation

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer any FIVE full questions, selecting*
at least TWO questions from each part.
2. Statistical tables A.6 and A.8 from the
text book can be provided.

PART – A

1   a. List any five circumstances, when the simulation is the appropriate tool and when it is not.
                                                                                    (10 Marks)
     b. Explain the steps in a simulation study, with the flow chart.   **(10 Marks)**

2   a. One company uses 6 trucks to haul manganese ore from Kolar to its 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 the loaders, the scale average loader and scale
         utilization. Assume 5 trucks are at the loaders and one is at the scale, at time "0". Stopping
         time $T_E = 64$ min.   **(10 Marks)**
     b. Explain simulation in GPSS, with a block diagram, for the single server queue simulation.
                                                                                    (06 Marks)
     c. Explain the following :
         i) System   ii) Event list   iii) Entity   iv) Event.   **(04 Marks)**

3   a. Explain discrete random variables and continuous random variables, with examples.
                                                                                    (10 Marks)
     b. Explain any two discrete distributions.   **(05 Marks)**
     c. Explain the following continuous distribution :
         i)   Uniform distribution
         ii)   Exponential distribution.   **(05 Marks)**

4   a. Explain the characteristics of a queuing system. List different queuing notations.   **(10 Marks)**
     b. Explain any two long-run measures of performance of queuing systems.   **(10 Marks)**

PART – B

5   a. Explain the two different techniques used for generating random numbers, with examples.
                                                                                    (10 Marks)
     b. The sequence of numbers 0.44, 0.81, 0.14, 0.05, 0.93 has been generated. Use the
         Kolmogonov-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. Compare F(X) and $S_N(X)$ on a
         graph.   **(10 Marks)**

6   a. Explain inverse-transform technique of producing random variates for exponential distribution.   **(05 Marks)**

      b. Generate three Poison variates with mean $\alpha = 0.2$.   **(05 Marks)**

      c. Explain the types of simulation with respect to output analysis. Give at least two examples.   **(10 Marks)**

7   a. Explain Chi-square goodness of fit test. Apply it to Poisson assumption with $\alpha = 3.64$. Data size = 100 and observed frequency O_i = 12, 10, 19, 17, 10, 8, 7, 5, 5, 3, 3, 1.   **(10 Marks)**

      b. List the steps involved in the development of a useful model of input data.   **(05 Marks)**

      c. Explain Chi-square goodness-of-fit test for exponential distribution, with an example.   **(05 Marks)**

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

      b. Explain any two output analysis for steady-state simulations.   **(10 Marks)**

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