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## 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 : (04 Marks)
 

i) System	ii) Event list	iii) Entity	iv) Event.
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- 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 : (05 Marks)
  - i) Uniform distribution
  - ii) Exponential distribution.
- 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 Poisson 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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