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**Eighth Semester B.E. Degree Examination, December 2012**  
**System Modeling and Simulation**

Time: 3 hrs.

Max. Marks:100

**Note: 1. Answer FIVE full questions**  
**atleast TWO questions from each part.**  
**2. Use statistical tables are permitted.**

**PART – A**

- 1 a. List the circumstances under which simulation is the appropriate tool and circumstances under which simulate is not the appropriate tool. (10 Marks)
- b. Explain in brief, with a neat figure the steps involved in simulation study. (10 Marks)
- 2 a. With the help of a flow diagram, explain the simulation of single channel queuing system. (10 Marks)
- b. One company uses 6 tracks to haul manganese are from Kolar to its industry. There are two loaders to load each truck. After loading, a track movers to the weighing scale to be weighted. The queue discipline is FIFO. When it is weighted 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 times :	10	5	5	10	15	10	10
Weigh times	12	12	12	16	12	16	
Travel times	60	100	40	40	80		

Calculate the total busy time of both loaders, of 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)

- 3 a. Explain discrete random variables and continuous random variables, with examples and explain any two discrete distributions. (10 Marks)
- b. A production process manufactures alternators for outboard engines used in recreational boating. On the average, 1% of the alternators will not perform up to the required standards. When tested at the engine assembling plant. When shipment of 100 alternators is received at plant, they are tested, and if more than two are non confirming, the shipment is returned to the alternators manufacture. What is the probability of returning a shipment? (10 Marks)
- 4 a. Explain the characteristics of queuing system. List the different queuing notations. (10 Marks)
- b. For the following sequence can the hypothesis that the numbers are uniformly distributed, on the basis of length using chi-square test.  $X_{0.05,9}^2 = 16.9$

0.34	0.90	0.25	0.89	0.87	0.44	0.12	0.21	0.46	0.67
0.83	0.76	0.79	0.64	0.70	0.81	0.94	0.74	0.22	0.74
0.96	0.99	0.77	0.67	0.56	0.41	0.52	0.73	0.99	0.02
0.47	0.30	0.17	0.82	0.56	0.05	0.45	0.31	0.78	0.05
0.79	0.71	0.23	0.19	0.82	0.93	0.65	0.37	0.39	0.42

(10 Marks)

## PART – B

- 5 a. Explain the 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 Kolmogorov – 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  $S_N(x)$ . [where  $D_{0.05,5} = 0.565$ ]. (10 Marks)
- 6 a. Explain the types of simulation, with respect to output analysis give at least two examples. (10 Marks)
- b. Consider the 30 two digit numbers in the sequence given below. Test whether the 3<sup>rd</sup>, 8<sup>th</sup>, 13<sup>th</sup> and so on, numbers in the sequence are auto correlated. Where  $\alpha = 0.05$  and  $[Z_{0.025} = 1.96]$

0.12	0.01	0.23	0.28	0.89	0.31	0.64	0.28	0.83	0.93
0.99	0.15	0.33	0.35	0.91	0.41	0.60	0.27	0.75	0.88
0.68	0.49	0.05	0.43	0.95	0.58	0.19	0.36	0.69	0.87

(10 Marks)

- 7 a. What do you mean by verification and validation of simulation model? Explain calibration and validation of models, with the help of diagram. (10 Marks)
- b. Explain Chi – square goodness of fit test. Apply it to Poisson assumption with  $\alpha = 3.64$ , data size = 100 and observed frequency. [where  $X_{0.05,5}^2 = 11.1$ ]
- 0; 12 10 19 17 10 8 7 5 5 3 3 1. (10 Marks)
- 8 a. Explain with neat diagram, model building, verification and validation. (10 Marks)
- b. Write short notes on :
- i) Optimization via simulation
  - ii) Time advance algorithm. (10 Marks)

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