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**Fifth Semester MCA Degree Examination, Dec. 2013/Jan. 2014**  
**System Simulation and Modeling**

Time: 3 hrs.

Max. Marks:100

**Note: 1. Answer any FIVE full questions.**  
**2. Statistical tables can be permitted.**

- 1 a. Define simulation. Draw a neat flow chart and explain the various steps in simulation study. (12 Marks)
- b. Mention the entities, attributes, activities and events for the following systems :  
 Hospital emergency room  
 Cafeteria  
 Laundromat  
 Taxicab company. (08 Marks)

- 2 a. Prepare a simulation table for a single channel queuing system, for 10 customers. Use the interarrival and service time as given in the below table. And also determine the following :  
 Ideal time of server  
 i) Average waiting time  
 ii) Average time customer spends in system  
 iii) Average service time

Interarrival time	-	5	10	1	2	3	8	5	8	4
Service time	5	8	5	6	5	5	8	3	3	5

- b. Explain briefly the event – scheduling/ time – advance algorithm. (10 Marks)
- 3 a. Explain any two from each of the discrete and continuous distribution function of the statistical models. (10 Marks)
- b. A recent survey indicated that 82% of single women aged 25 years old will be married in their life time using the binomial distribution. Find the probability that 2 or 3 women in a sample of twenty will never be married. (04 Marks)
- c. Hurricane hitting the eastern coast of India follows Poisson with a mean of 0.5 per year. Determine :  
 i) The probability of more than 3 hurricanes hitting the Indian eastern cost in a year  
 ii) The probability of not hitting the Indian eastern coast in a year. (06 Marks)

- a. Explain in detail, the characteristics of queuing system. (10 Marks)
- b. Explain briefly the simulation in Java with an example for single server queuing system. (10 Marks)

- 5 a. Use Kolmogorov – Smirnov test with  $\alpha = 0.05$  to determine whether the hypothesis that the numbers given below are uniformly distributed on the interval  $[0, 1]$  can be rejected. (Given the critical value  $D_{0.05, 9} = 0.432$ )  
 The random numbers are : 0.73, 0.82, 0.16, 0.72, 0.79, 0.95, 0.57, 0.63, 0.39. (10 Marks)
- b. Explain the acceptance – rejection technique for the Poisson distribution with its algorithm. Generate 5 random variates by using the Poisson distribution function with  $\alpha = 0.4$ . Given random numbers are : 0.4709, 0.8503, 0.9466, 0.0015, 0.8768, 0.0379, 0.8520, 0.3026, 0.1502. (10 Marks)

- 6 a. Explain the steps involved in developing input model. Also list any six suggestions which is used for enhancing and facilitating the data collection. (08 Marks)
- b. Records pertaining to the monthly number of job – related injuries at an underground coalmine were being studied by a federal agency. The values for the past 100 months were as follows :

Injuries /month	0	1	2	3	4	5	6
Frequency of occurrence	35	40	13	6	4	1	1

- Use  $\chi^2$  = test to check whether the data follows Poisson distribution at 5% level of significance. (Given critical value is  $\chi_{0.05,2}^2 = 5.99$ ). (12 Marks)
- 7 a. Explain the tree – step process of Naylor – Finger approach. (10 Marks)
- b. Explain the types of simulation with respect to output analysis. Differentiate between the point and interval estimation. (10 Marks)
- 8 Write short notes on :
- List processing
  - Q – Q plot
  - Network of queues
  - Optimization via simulation is difficult - justify it. (20 Marks)

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