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SEAT No. :

P1822

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M.Sc.

COMPUTER SCIENCE

CS - 405 : Modeling & Simulation

(2013 Pattern) (New) (Semester - IV)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Attempt any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary***

Q1) Attempt the following.

a) What is stepped and event based time in simulations. **[4]**

b) Discuss the components of an Experimental frame. **[4]**

c) What are hybrid simulations. **[2]**

Q2) Attempt the following.

a) Write a note on sources and propagation of error. **[4]**

b) Discuss the characteristics of a good random number generator. **[3]**

c) Explain the process of verification and validation of a model. **[3]**

Q3) Attempt the following.

a) Write a note on 'Need for Modeling and Simulation'. **[4]**

b) Discuss the different types of Simulations. **[4]**

c) What is the importance of a simulation clock. **[2]**

Q4) Attempt the following.

a) Explain all the entities of the Framework for Modeling & Simulation. **[4]**

b) What is a random variable and a distribution function. **[4]**

c) Which are the different Types of model validity. **[2]**

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Q5) Attempt the following.

a) Explain Switching Automata with an example. **[4]**

b) Discuss Qualitative and Quantitative comparison of a Model and source System behavior. **[4]**

c) Compare 'Static' and 'Dynamic' simulation models. **[2]**

Q6) Attempt the following.

a) Discuss the models of arrival processes. **[5]**

b) How is testing of hypothesis done. **[3]**

c) What is Fitness of a cell in cell automata. **[2]**

Q7) Write a note on the following.

a) Write a note on Probability distributions and estimation. **[5]**

b) What are the differences between 'Experimenting with actual system' and 'Experimenting with a model of the system' **[5]**

Q8) Attempt the Case Study and answer the following questions

"Single Server Queuing System"

Consider a single server queuing system for which the inter arrival times A 1, A2, .. are independent and identically distributed random variables. A customer who arrives and finds the server idle enters service immediately, and the service times S1, S2,... of the successive customers are IID random variables that are independent of the inter arrival times. A customer who arrives and finds the server busy joins the end of a single queue. Upon completing service for a customer, the server chooses a customer from the queue in a first-in first out manner.

The simulation will begin in the "empty-and-idle" state i.e .. no customers are present and the server is idle. At time 0, we will begin waiting for the arrival of the first customer, which will occur after the first inter arrival time, A1, rather than at time 0. We wish to simulate this system until a fixed number(n) of customers have completed their delays in queue; i.e., the simulation will stop when the nth customer enters service. Note that the time the simulation ends is thus a random variable, depending on the observed values for the inter arrival and service time random variables.

From a single run of the simulation resulting in customer delays D1, D2, .. ,Dn. Expected average number of customers in the queue is denoted by q (n). Q (t) denotes the number of customers in queue at time t. T (n) is the time required to observe 'n' delays in queue.

Questions

a) Define Discrete and Continuous system. Identify whether the System is Discrete or Continuous System and justify your answer **[5]**

b) Identify the following components for the system:- **[5]**

System state, Simulation Clock, Event List,

Initialization routine and Report Generation

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