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BT-8/M-20 38008

# SIMULATION AND MODELING

Paper–CSE-474-E

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt five questions in all, selecting at least one question from each Unit. All questions carry equal marks.

## UNIT–I

1. (a) Differentiate Modelling and Simulation.

   (b) What do you understand by system environment? What is the role of system environment in system simulation?

   (c) Think of any three real life problems which can be and cannot be solved by analytical/numerical methods? 3×5=15

2. (a) Differentiate Physical model and Mathematical model.

   (b) Which principles are used in modelling? Explain them in detail. 2×7½=15

## UNIT–II

3. (a) Differentiate following :

   (i) Continuous simulation vs. Numerical integration.

   (ii) Analog vs. Digital simulation. 2×5=10

   (b) Develop an algorithm to find a series of Pseudo random values from a given exponential distribution function. 5

4. How to simulate an inventory system with discrete variables? Draw a flow-chart and also write a program in any programming language to simulate an inventory system with discrete variables. 15

## UNIT–III

5. (a) If we want to construct a dam accross a river for 150 years, then, how to simulate this problem which will never fail. Explain with algorithm in brief. 10

   (b) Write an algorithm to simulate hypothetical computers (SMAC). 5

6. Consider a single server queuing system with Poisson arrival pattern and service times for which long term averages are "a" and "b" respectively and the queue discipline is FIFO. let $P_n(t)$ be the probability of n customers in the system at any time 't'. Prove that

$$dP_n(t)/dt = P_{n+1}(t)/b - (1/a + 1/b)P_n(t) + P_{n-1}(t)/a$$

and show that the probability that there being more than n customers in the system = $(b/a)^{n+1}$.

And Also compute the average number of Customers in the Queuing system. 15

UNIT–IV

7. (a) What do you understand by Validation. Also explain, how validation relates with system simulation. 5

(b) Which variance reduction techniques are used in simulation? Explain all these techniques in detail. 10

8. (a) What is Central limit theorem. Differentiate between static and dynamic stochastic simulation experiments. Give appropriate example. How would you eliminate transientness in case of dynamic stochastic simulation experiments? 10

(b) Derive an expression to find the run-length of static simulation experiment. 5