

**MCA/MX**  
**System Simulation**  
**Paper : MCA-203**

**5253**

Time : Three Hours]

[Maximum Marks : 80

**Note :-** Attempt **FIVE** questions in all. Question No. **1** is compulsory. Attempt remaining **FOUR** questions by selecting only **ONE** question from each Unit.

1. (a) What do you understand by system ? Explain the system and its components with the help of a suitable example. 3
- (b) Explain the difference between Physical and Mathematical models. 3
- (c) Explain the need of Simulation in Business. 3
- (d) Differentiate System and State variables through examples. 3
- (e) List out the disadvantages of Analog Simulation. 3
- (f) Explain the use of queuing systems in Call-Centres. 3
- (g) What do you understand by Stochastic Convergence ? 3
- (h) How would you eliminate the effect of transients in Dynamic Stochastic Simulation experiments ? 3

**UNIT-I**

2. (a) (i) Define the term 'Model' and describe various types of Models. 7
- (ii) Give disadvantages of Analog Simulation. 7
- (b) Define Simulation. List out the steps involved in solving the problem by Computer Modeling and Simulation process. 7

3. (a) Differentiate :
- (i) Fixed Time Step Simulation vs. Event-to-Event Simulation
  - (ii) Magnitude scaling and Time scaling in Analog Simulation. 7
- (b) Write short notes on :
- (i) 'Different Views of the system'.
  - (ii) Entities, Attributes and Activities of a 'Computer System'. 7

## UNIT-II

4. (a) Discuss :
- (i) Uniformity, and (ii) Independence Test, for testing a sequence of pseudo-random numbers. 7
- (b) Write an algorithm to generate a sequence of N pseudo-random numbers which follows Normal Distribution. 7
5. Simulate any **two** of the following systems :
- (i) Water Reservoir System
  - (ii) Telephone System
  - (iii) Simulation of a Pure-Pursuit Problem. 7×2

## UNIT-III

6. Write a program in any high level language to simulate a Two-Server queuing system with common queue characterized by FIFO discipline. Choose appropriate arrival and service patterns. Also explain how this simulator can be further extended for M-Server queuing system ? 14

7. (a) Simulate an Inventory System mathematically to derive an expression for EOQ of a system in which we run out of Stock for a certain fraction of time, by choosing appropriate system boundaries. 7
- (b) How would you generate the Poisson variates for any specified value of  $\lambda$  ? 4
- (c) Write a short note on 'Forecasting through simulation'. 3

## UNIT-IV

8. Define Central Limit theorem. Derive an expression to find the Run-Length of Dynamic Stochastic Simulation experiments for 95% confidence level. 14
9. (a) Describe the following variance reduction tools :
- (i) Antithetic Sampling
  - (ii) Importance Sampling. 7
- (b) Discuss good and bad features of any Discrete System Simulation Language. 7