Roll No. ………………………..

Time : Three Hours   [Maximum Marks : 80]

Note :- Attempt **Five** questions in all. Question No. **1** is compulsory. In addition, students have to attempt **Four** questions selecting **One** from each unit.

1. (i) Discuss the difference between modeling and simulation.
  (ii) Identify entities, attributes and activities of the system you are familiar with.
  (iii) Discuss the use of simulation in Engineering and Research.
  (iv) Describe various type of models of their general characteristics.
  (v) What do you understand by Non-Unique representation of a system?
  (vi) How would you convert Computer Program for 2-server queuing system to Computer Program for K-server queuing system?
 (vii) Explain the use of Box-Muller Transformation.
 (viii) Write a short note on DYANMO(simulation language) user for continuous system simulation.   8*3

UNIT-I

2 (a) Write an essay of nature, applications, and Limitations of simulation.   9
  (b) Why study modeling? Explain the difference between Modelling and Simulation. 5
3. Write short notes on :-
  (a) Stochastic Models
  (b) "When to use Simulation"
  (c) System boundaries and System Environment.   4+4+6

UNIT-II

4 (a) Differentiate :-
      (i) Analog Simulation Vs. Hybrid Simulation.
      (ii) Numerical Integration Vs. Continuous Simulation   4+4
  (b) Develop on algorithm to evaluate the value of $\sqrt{3}$ using Monte Carlo Computations. 6

5 (a) Explain Inverse Transformation Method for generating a random sample from a given non-uniform probability distribution function say F (t).   7
  (b) Write an algorithm for a non-linear second- order servo system.   7

UNIT-III

6. Describe the process of developing a simulator in a high level language for a single   server queueing system with following characteristics:-
  (a) Arrival and Service pattern follow the normal probability distributions (μ_{at}, $\sigma_{at)}$, and (μ_{st}, $\sigma_{st)}$, respectively, and
  (b) The queue discipline is First Come First Serves.   14

7.   Write a computer program in any high level language to simulate an Inventory Control System with large number of Record Combinations (P-Recorder Point, Q-Recorder Quantity) in order to determine the optimal combination which yield maximum service level for a given average stock. Choose appropriate system boundaries.   14

UNIT-IV

8. **(a)**   Derive a mathematical expression to find the Run length of a static stochastic simulation experiment using the concept of Central Limit theorem.   10

   (b)   List out several methods of removing the effect of transients is dynamic stochastic simulation experiments.   4

9 **(a)**   Describe any two techniques for reducing the variance of a simulation experiment without increasing the number of runs.   3*2=6

   (b)   Explain the difference between Block Structures and Expression based simulation Language with the help of suitable example.

   Also enumerate common characteristics of these Languages.   4+4