

N.B. : (1) Question no. 1 is compulsory.

(2) Attempt **four** questions out of remaining **six** questions.

1. (a) Elaborate the steps in simulation study. Why is it necessary to have program and process documentation ? **10**
- (b) Discuss simulation application in any **one** of the following system : **10**
- (i) Check-out counter at supermarket
 - (ii) Banking system
 - (iii) Passenger flow analysis in an Airport terminal.
2. (a) Define Event, Event notice, Event list, Activity, Delay and Clock. **12**
What is boot strapping ?
Compare event scheduling, process interaction and activity scanning algorithms .
- (b) Give the input parameters, simulation variable, output statistics for the queueing system. Calculate the output statistics for the queueing system whose interarrival and service times for ten arrivals are given below : **8**
- Interarrival time** : 8 6 1 8 3 8 7 2 3
Service time : 4 1 4 3 2 4 5 4 5 3.
3. What are the costs associated with inventory system ? **20**
Describe the inventory system when –
- (a) Lead time is zero.
 - (b) Lead time is independent of demand.
 - (c) Lead time is dependent on demand.
4. (a) State the conservation equation. Discuss the long-run measure of performance of the queueing system, Viz., Time average Number in system L and Average time spent in system per customer, W. **10**
- (b) Give the equation for steady state parameters of M/G/1 queue and derive M/M/1 from M/G/1. **10**
5. (a) How would you generate random numbers to test the reliability of a system ? **10**
State the hypothesis for testing the property of random numbers.
What do you understand by level of significance ?
- (b) By using Inverte Transform Technique which of the distributions random variates can be generated ? **10**
Develop a random-variate generator for a random variable X with the p.d.f.
- $$f(x) = \begin{cases} e^{2x}, & -\infty < x \leq 0 \\ e^{-2x}, & 0 < x < \infty \end{cases}$$
6. (a) Suggest a distribution for the following process in the computer assembly shop : **5**
- (i) Number of defective chips found in a lot of n chips.
 - (ii) Number of computer chips that we must inspect to find 5 defective chips.
 - (iii) Time to assemble a computer which is the sum of the times required for each assembly operation.
 - (iv) Time to failure for a disk drive.
 - (v) If the mimimum, most-likely and maximum time required to test a product is known.
- Explain quantile – quantile plot and state its use. **5**
- (b) What do you understand by model verification and validation ? How would you validate input–output transformation of a model ? **10**
7. (a) State the effect of initialization bias in steady state simulation and how can the effect be reduced. **10**
- (b) Draw the block digram of any case study in Manufacturing and Materials Handling simulation. Suggest performance measures. **10**