

## Revised Course

3 Hours

Total Marks: 80

**N.B. (1) Question No.1 is compulsory.**

- (2) Out of remaining **five** questions, attempt any **three** questions.  
 (3) Assume suitable data, if required but justify the same.  
 (4) Figures to the right indicate full marks.  
 (5) Use of **Statistical Table** is allowed.



- Q1 (a) Explain steps in simulation study along with the flowchart. [10]  
 (b) Explain the properties of a Poisson Process. [05]  
 (c) Perform the simulation of the following inventory system, given daily demand is represented by the random numbers 4, 1, 8, 5, 2 and the demand probability is given by [05]

Demand	Probability
0	0.2
1	0.5
2	0.3

If the initial inventory is 4 units, determine on which day the shortage condition occurs.

- Q2 (a) State the queueing notation, queue discipline and queue behavior. [10]  
 (b) Given the input parameters, simulation variable, output statistics for the queueing system. Calculate the output statistics for the queueing system whose inter-arrival and service times for ten arrivals are given below: [10]

Inter-arrival time	--	8	6	1	8	3	8	7	2	3
Service time	4	1	4	3	2	4	5	4	5	3

- Q3 (a) Consider the following sequence of random numbers. How would you test it for independence based on runs above and runs below the mean for the significance level  $\alpha = 0.05$  and the critical value  $Z_{0.025} = 1.96$  [10]

0.12	0.01	0.23	0.28	0.89	0.31	0.64	0.28	0.33	0.93
0.39	0.15	0.33	0.35	0.91	0.41	0.60	0.25	0.55	0.88

- (b) Explain Inverse transform technique for random variate generation. Support your answer with suitable example. [10]
- Q4 (a) What is the purpose of model verification? What are the different ways available to verify a model? [10]  
 (b) Draw the flowchart for arrival and departure event in single server system. Compare event-scheduling, process interaction and activity scanning algorithms. [10]

Turn Over

- Q5 (a) The following is set of single digit numbers from a random number generator. Using appropriate test check whether the numbers are uniformly distributed.  $N = 50$ ,  $\alpha = 0.05$ ,  $\chi_{0.05,9}^2 = 16.9$  [10]  
 {6, 7, 0, 6, 9, 9, 0, 6, 4, 6, 4, 0, 8, 2, 6, 6, 1, 2, 6, 8, 5, 6, 0, 4, 7, 1, 3, 5, 0, 7, 1, 4, 9, 8, 6, 0, 9, 6, 6, 7, 1, 0, 4, 7, 9, 2, 0, 1, 4, 8}

- (b) The following data were available for the past 10 years on demand and lead time. [10]

Lead Time	6.5	4.3	6.9	6.0	6.9	6.9	5.8	7.3	4.5	6.3
Demand	103	83	116	97	112	104	106	109	92	96

Estimate correlation and covariance.

- Q6 (a) Explain the batch means for interval estimation in steady state simulation. [10]  
 (b) What are the objectives of simulation in a manufacturing system? Give the block diagram and explain the sequence of operations in a manufacturing system. Suggest a suitable simulation language for the same. [10]

\*\*\*\*\*