Paper / Subject Code: 53109 / Computer Simulation & Modeling

(3 Hours)   **[Total Marks: 80]**

N.B.: (1) Question **No.1** is **Compulsory**.
    (2) Attempt **any three** questions from **remaining** questions.
    (3) Assume **suitable** data wherever required but **justify** the same.
    (4) **Figures** to the **right** indicate **full marks**.
    (5) Answer to each new question to be started on a **fresh page**.

1. (a) Define Simulation. Explain when simulation is an appropriate tool and when it is not. **(10)**

    (b) Explain Naylor and Finger approach for validation of model. **(10)**

2. (a) Calculate the output statistics for the queueing system whose inter-arrival and service **(10)** times for ten arrivals are given below:

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

    (b) Describe the Event scheduling / Time advance algorithm. Give the system snapshots. **(10)**

3. (a) A car wash facility washes cars in four steps- soap, rinse, dry, and vacuum performed **(10)** by one worker. The duration of each step is exponentially distributed with a mean of 9 minutes. A car has to finish with all the four steps to enable the next car to begin the process. Find the probability that the car wash will take 30 minutes or less. Also, compute the expected length of the wash and the modal value.

    (b) Using direct transformation technique, design a generator for normal and lognormal **(10)** distribution.

4. (a) Test the following random numbers for independence by runs up and runs down test. **(10)** Take $\alpha = 0.05$ and the critical value $Z_{0.025} = 1.96$.
{0.21,0.17,0.13,0.26,0.33,0.13,0.02,0.34,0.18,0.22}

    (b) Explain Inventory system. Discuss the cost involved in inventory systems. **(10)**

5. (a) Give the equations for steady state parameters of M/G/1 queue and derive M/M/1 from **(10)** M/G/1.

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

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

Estimate correlation and covariance.

6. Write short notes on (**any two**): **(20)**
    (a) Goals and Issues in simulation of manufacturing systems.
    (b) Poisson Process and its properties.
    (c) Steps in simulation study.
    (d) Output analysis for terminating simulation.