M.Sc. Second Semester Degree Examination

COMPUTER SCIENCE — Paper – 2.2

Modeling and Simulation

(Old Syllabus w.e.f. 2003-04)

Time : 3 Hours]   [Max. Marks : 80

Instructions : 1) *Answer any **five** questions.*

2) *All questions carry **equal** marks.*

1. (a) Explain the terms : Stochastic Process and the classification of stochastic process.

    (b) Describe the one-step and n-step transition probability matrices (t.p.m.) with suitable example.

2. (a) Show that the n-step t.p.m. of a Markov Chain is the nth power of one-step t.p.m.

    (b) The one-step t.p.m. of a Markov Chain $\{X_n, n = 0, 1, 2, \cdots\}$ with state spare $\{1, 2, 3\}$ is

    $$P = \begin{matrix} & \begin{matrix} 1 & 2 & 3 \end{matrix} \\ \begin{matrix} 1 \\ 2 \\ 3 \end{matrix} & \begin{pmatrix} \frac{1}{2} & \frac{1}{4} & \frac{1}{4} \\ \frac{1}{3} & \frac{1}{3} & \frac{1}{3} \\ \frac{1}{5} & \frac{2}{5} & \frac{2}{5} \end{pmatrix} \end{matrix}$$

    Obtain :

    (i) $P[X_2 = 3 \,|\, X_0 = 2]$

    (ii) $P[X_0 = 1 \,|\, X_2 = 1]$ with initial probability $P(i) = \frac{1}{3}; \; i = 1, 2, 3$.

3. (a) Describe the structure of the Queueing system with neat block diagram.

    (b) Obtain steady-state solution for M/M/1 queueing system.

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4. (a) Distinguish between discrete system simulation and continuous system simulation.

    (b) Explain the Monte Carlo method of simulation.

5. (a) What do you mean by pseudo random numbers? Explain how pseudo random numbers are generated.

    (b) Design simulation steps to generate the n observations from $B(1, p)$.

6. (a) Explain the terms :

    (i) Deterministic simulation

    (ii) Stochastic simulation

    (b) Design an algorithm to simulate the queueing system.

7. (a) Discuss the GPSS blocks used in simulation of a queueing system.

    (b) Write GPSS codes for simulating a queueing system where the arrival distribution is $N(5, 10)$ and service time distribution is exponential with mean 3 minuts.

8. Write short notes on any **two** the following :

    (a) Validation of Simulation Models

    (b) Inventory Models

    (c) Generation of exponential observations