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B. TECH.
(SEM VI) THEORY EXAMINATION 2018-19
SIMULATION MODELLING AND ANALYSIS

Time: 3 Hours ***Total Marks: 70***

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 7 = 14**

a. List the entity, attribute and activity in the case of "Traffic".
b. What are the steps in simulation study?
c. Explain the properties of random number.
d. How queuing model is useful for Simulation?
e. Differentiate between Continuous and Discrete Systems.
f. What is random variate?
g. What do you mean by Gap test?

SECTION B

2. Attempt any *three* of the following: **7 x 3 = 21**

a. Differentiate between Static mathematical model and dynamic mathematical model with suitable examples.
b. Consider an inventory control problem in which demand during lead time as well as lead time distributions are given below in table. The reorder point is 6 units and reorder quantity are 12 units. If the ordering cost is Rs.100/- per order, inventory carrying cost is Rs.4/ unit/week and shortage cost is R.60/unit/week. Find the total inventory cost for 15 weeks. Assume an initial inventory of 10 units.

Demand	*Probability*	*Lead time (weeks)*	*Probability*
0	0.10	2	0.20
1	0.45	3	0.65
2	0.30	4	0.15
3	0.25		

Assume the following random number for the demand: 49, 67, 06, 30, 95, 01, 70, 80, 66, 69, 76, 86, 56 and 84. Also assume the following random number for the lead time: 84, 79, 15, 03.

c. What is the different inverse transform techniques for random variate generation? Write the steps for Triangular and Weibull distributions.
d. A pair of fair dies is rolled once. Let x be the random variable whose value for any outcome is the sum of the two numbers on the dies.
   (i) Find the probability function of x. Construct the probability table and a probability chart
   (ii) Fine the probability that x is an odd number
   (iii) Find $P\ (3 \leq x_i \leq 9)$ and $P\ (0 \leq x_i \leq 4)$.
e. Why is optimization via simulation difficult? Explain in brief.

SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7

(a) Define simulation. "When it becomes difficult to use an optimization technique for solving a problem, one has to resort to simulation". Discuss.

(b) A sequence of 10,000 five-digit random number has been generated, and an analysis of number indicate that there are 3075 numbers having five different digits, 4935 having a pair, 1135 having two pairs, 695 having three of a kind, 105 having full house (three of a kind and a pair), 54 having four of a kind and one having all five of a kind. Use Poker test to determine if these random numbers are independent, at $\alpha = 0.01$.

4. Attempt any *one* part of the following: 7 x 1 = 7

(a) Explain how do you apply Monte Carlo simulation technique to solve problem. How is the value of constant **'π'** evaluated using Monte Carlo simulation?

(b) A dentist schedules all her patients for 30 minutes appointments. Some of the patients take more or less than 30 minutes depending on the type of dental work to be done. The following summary shows the various categories of work, their probabilities and the time needed to complete the work.

Category	*Time required (minutes)*	*Probability of category*
Filling	45	0.40
Crown	60	0.15
Cleaning	15	0.15
Extraction	45	0.10
Checkup	15	0.20

Simulate the dentist's clinic for four hours and determine the average time for the patients as well as the idleness of the doctor. Assume that all the patients show up at the exactly their scheduled arrival times, starting at 8 A.M. Use the following random numbers for handling the above problem: 40, 82, 11, 34, 25, 66, 17 and 79.

5. Attempt any *one* part of the following: 7 x 1 = 7

(a) Write the steps involved in acceptance rejection technique using Gamma Distribution with an example.

(b) If X and Y are jointly continuous random variables with joint probability density function *f (x, y)* and X and Y are independent, show that *Cov(X , Y) = 0*. Therefore, X and Y being independent implies that E (XY) = E(X)E(Y). All the notation has usual meaning.

6. Attempt any *one* part of the following: 7 x 1 = 7

(a) Explain the different methods employed for validation and verification of simulation models.

(b) What are steps involved in the development of an input model?

7. Attempt any *one* part of the following: 7 x 1 = 7

(a) How measures the performance and their estimation of a simulated system? Explain in brief.

(b) With illustrative examples explain output analysis of steady-state simulations.