Dr. Vivek Sehgal.

Roll No:.....

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

MID TERM EXAMINATION- June 2018

B.Tech VI Summer Semester IT

COURSE CODE: 16B22CI621 MAX. MARKS: 50

COURSE NAME: Data Analysis and Simulation Techniques

COURSE CREDITS: 04 MAX. TIME: 2 Hrs

Note: *All questions are compulsory. Each question carries equal marks. Carrying of mobile phone during examinations will be treated as case of unfair means.*

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1. (a) What is Monte Carlo Simulation Technique?
   (b) How does the Monte Carlo Simulation Work?
   (c) List the Benefits of the Monte Carlo Simulation Technique
   (d) List the Software to perform the Monte Carlo Simulation

2. Write a Monte Carlo simulation to model a biased coin as follows. When flipped if the coin show tails it has a 50% chance of tails or heads on the next flop. However, if the coin shows heads then it has 75% chance of showing heads again on the next flip. The Monte Carlo simulation should determine the probability of a head showing. You may assume that you have access to a function rand_val ( ) that returns uniform (0.0, 1.0).

3. For an M/M/1 queue we know that the mean number of customers in the system (L) is equal to the utilization divided by one minus the utilization. Using basic laws and relationships, derive the mean wait in the system (W), the mean number of customers in the queueing area (Lq), and the mean wait in the queuing area (Wq) as a function of arrival rate and service rate. For full credit, your expressions need to be simplified.

4. Consider a single server queue with Poisson arrivals (rate λ) and a uniformly distributed service time (with minimum value a seconds and maximum value b seconds). Solve for the mean number of customers in the system (L). You do not need to simplify your expression for L.

5. Consider the following single-server queueing system from time = 0 to time = 10 sec. Arrivals and service times are:
   - Customer #1 arrives at t = 1 second and requires 2 seconds of service time
   - Customer #2 arrives at t = 2 second and requires 2 seconds of service time
   - Customer #3 arrives at t = 5 seconds and requires 2 seconds of service time
   - Customer #4 arrives at t = 8 seconds and requires 2 seconds of service time

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Solve for system throughput (X), total busy time (B), mean service time (Ts), utilization (U), mean system time (delay in system) (W), and mean number in the system (L). Show your work to receive full credit.