NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute)
Affiliated to Dr. A.P.J. Abdul Kalam Technical University, Uttar Pradesh, Lucknow
M.Tech
SEM: I - THEORY EXAMINATION (2021 - 2022)
Subject: Simulation Modelling and Analysis

Time: 03:00 Hours   Max. Marks: 70

General Instructions:

1. All questions are compulsory. It comprises of three Sections A, B and C.

- Section A - Question No- 1 is objective type question carrying 1 mark each & Question No- 2 is very short type questions carrying 2 marks each.
- Section B - Question No- 3 is Long answer type - I questions carrying 4 marks each.
- Section C - Question No- 4 to 8 are Long answer type - II questions carrying 7 marks each.
- No sheet should be left blank. Any written material after a Blank sheet will not be evaluated/checked.

<div align="center">SECTION A   15</div>

1. Attempt all parts:-

1-a.   Simulation should be thought as a technique for (CO1)   1

        1. increasing one's understanding of a problem.

        2. obtaining a relatively inexpensive solution to a problem.

        3. obtaining an optimal solution to a problem.

        4. providing quick and dirty answers to complex problems.

1-b.   The first step in the Monte Carlo simulation process is to (CO2)   1

        1. generate random numbers.

        2. set up cumulative probability distributions.

        3. establish random number intervals.

        4. set up probability distributions.

1-c.   Customers arrive at a reception counter at an average interval rate of 10 minutes and   1
        the receptionist takes an average of 6 minutes for one customer. Determine the
        average queue length. (CO3)

        1. 0.9

        2. 0.8

        3. 0.6

        4. 1.1

1-d.   When used in the fprintf command, the \n is used to (CO4)   1

        1. add a space between any two characters

        2. add a line space (enter key)

        3. place a number into the comment

        4. clear the comment

1-e.   The num2str command (CO5)   1

        1. converts a number to string

        2. converts string to a number

        3. concatenates numbers and strings

4. concatenates strings

2. Attempt all parts:-

2-a.   List the entities, event, attributes, activities and state variables of communication. (CO1)   2

2-b.   Explain a simulation model for a Inventory System. (CO2)   2

2-c.   Why random numbers are known as Pseudo-Random number? (CO3)   2

2-d.   What will be the input model for a supply-chain simulation model. (CO4)   2

2-e.   Explain mathematical Function Library in MATLAB. (CO5)   2

<div align="center">SECTION B   20</div>

3. Answer any <u>five</u> of the following:-

3-a.   How can we offset the disadvantages of simulation? (CO1)   4

3-b.   List the application areas/Industry domains of simulation. (CO1)   4

3-c.   If an M/M/1 queue has utilization of 80%, what is its mean queue length? If the arrival rate is 100 jobs per second (and utilization is 80%), what is the mean response time? (CO2)   4

3-d.   Which method is used to develop model for the ATM (bank) case study? (CO2)   4

3-e.   Explain the linear congruential method for random number generation. (CO3)   4

3-f.   Define the following terms, in the context of modeling and simulation: (CO4)   4
            - Verification
            - Validation
            - Credibility

3-g.   What are the basic plots and graphs of MATLAB? (CO5)   4

<div align="center">SECTION C   35</div>

4. Answer any <u>one</u> of the following:-

4-a.   Discuss some current "open research problems" in the area of simulation. (CO1)   7

4-b.   Explain 5 typical applications of simulation each in (a) manufacturing system (b) transportation systems? (CO1)   7

5. Answer any <u>one</u> of the following:-

5-a.   The computer lab at State University has a help desk to assist students working on computer spreadsheet assignments. The students patiently form a single line in front of the desk to wait for help. Students are served based on a first-come, first-served priority rule. On average, 15 students per hour arrive at the help desk. Student arrivals are best described using a Poisson distribution.
The help desk server can help an average of 20 students per hour, with the service rate being described by an exponential distribution. Calculate the following operating characteristics of the service system.
(a) The average utilization of the help desk server
(b) The average number of students in the system
(c) The average number of students waiting in line
(d) The average time a student spends in the system
(e) The average time a student spends waiting in line
(f) The probability of having more than 4 students in the system   (CO2)   7

5-b.   Jobs arrive at a facility at an average rate of 5 in an 8 hour shift. The arrival of the jobs follows Poisson distribution. The average service time of a job on the facility is 40 minutes. The service time follows exponential distribution. Idle time (in hours) at the facility per shift will be............................ (CO2)   7

6. Answer any <u>one</u> of the following:-

6-a.   Explain with an example the Kolmogorov-Smimov test for random numbers. (CO3)   7

6-b.   How random numbers are generated using random number streams?(CO3)   7

7. Answer any <u>one</u> of the following:-

7-a. Can a simulation model be verified but not validated and vice-versa? Investigate 7
    your answer with an example for each. (CO4)

7-b. Discuss 5 techniques for increasing a model's validity and credibility. (CO4) 7

8. Answer any <u>one</u> of the following:-

8-a. Explain the different simulation software with their features. (CO5) 7

8-b. How to solve a supported beam problem in ABACUS for deflection and 7
    stresses. (CO5)