# MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

**CS-805: SIMULATION and MODELING**

1. **State the desirable features of simulation software.**

The desirable features of simulation software are:

- General capabilities

- Hardware and software considerations

- Animation

- Statistical features

- Customer support and documentation

- Output reports and plots

General capabilities:

-Ability to define and modify the attributes of entities and global variables and use decision logic.

-Ability to use formulas and math functions.

-Ability to create new models and modify existing ones.

Hardware and Software requirements:

-Consider the computer platforms available in the software.

-Software packages must be available and compatible across multiple platforms.

-Consider the amount of RAM required to run the software.

-Consider the working OS such as Windows 98, Windows NT, and UNIX.

Animation:

-The simulation software must provide the default animation as part of the modelling build process.

-Simulations need to be able to create high resolution icons and save them for reuse.

-The software must be equipped with a standard icon library.

-One should be able to import CAD drawings and clip art into animation.

-Often expected to display dynamic graphics On-screen statistics as simulation is done.

Statistical Features:

-Simulation software should have good statistical analysis capabilities, to achieve correct results.

-The software needs a good random number generator.

-Simulation software should allow users to specify performance measurements to collect output data.

1. **What is discrete event simulation explain with the suitable example?**

Discrete Event Simulation (DES) is a method of simulating the behaviour and performance of a real process, facility, or system. DES is widely used in healthcare services to improve computer speed and memory, so these techniques are applied to the problem of increasing size and complexity.

For example, a truck arrives at a warehouse, goes to a disassembled gate, opens it, and departs. Discrete event simulations are often selected for these simulations.

The movement of a train from point A to point B is modelled by two events: departure and arrival by using Discrete Event Simulation. The actual train movement is modelled as a delay between the departure and arrival events. We can smoothly animate events and movements between them.

Discrete event simulation focuses on the processes of the system with an intermediate level of abstraction. Normally, we do not see specific physical details such as car shape or train acceleration. Discrete event simulation modelling is widely used in manufacturing, logistics, and healthcare.

1. **What is event scheduling simulation?**

The sequence of actions that the simulator needs to perform to advance the clock and take a snapshot of a new system is called an event / time scheduling algorithm.

A mechanism that increases the simulation time so that all events occur in the correct time is based on the Future Event List (FEL).

The FEL always contains all upcoming and related events (called t1, t2, ..) that were previously scheduled. The FELs are sorted by event time. That is, the events are arranged in chronological order. In other words, the time of the event is t <t1 <t2 <t3 <.... <tn

Time t is the CLOCK value, which is the current value of the simulation time.

Events related to t1 hours are called future events.

After the system snapshot when the CLOCK = t simulation is updated, the CLOCK is transferred to the CLOCK = t1 simulation time and notifications for upcoming events are removed from the FEL.

Upcoming event execution means a snapshot of the new system at the time t1 was created, based on the old frame of time t and the nature of the event being executed. At time t1, the next event may not be created, but if it is, it is scheduled by creating an event notification and placing it in the appropriate location on the FEL.

When the new system that captures time t1 is updated, time starts a new event that processes and runs the event. This process repeats until the simulation is completed.

Event Scheduling Algorithm:

Step 1. Remove event notifications for upcoming events from the FEL.

Step 2. Transfer the CLOCK to the next event time (i.e move CLOCK from t to t1).

Step 3. Follow the execution of events in an order (status system updates, entity changes, manage attributes and required membership).

Step 4. Create upcoming events (if needed) and post event announcements to the FEL using the event time rankings. (Example: Event 4 occurs at t and t2 <t <t3).

Step 5. Update cumulative statistics and counters.

1. **Can random number generators be predicted?**

After observing some "random" output, we can say that the prediction of the next "random value" is possible via the random number generator. This is commonly referred to as RNG cracking, breaking, or attacking. Searching for these terms with "random number generator" can give us a lot of results.

1. **What is the theory of randomness?**

Randomness is termed as the lack of patterns or predictions. Random variables are displayed in random order. A random process is a sequence of random variables whose results do not follow a deterministic pattern, but follow an evolution that describes a probability distribution. Randomness is really hard to define formally. Random processes are considered to be more time consuming, but unpredictable. This can be defined as the Theory of Randomness. Randomness has very important uses in various areas of mathematics. In statistics, random sample selection is important to ensure that the study is conducted evenly.

1. **What is the difference between random and pseudorandom?**

Pseudo Random Numbers:

-Mathematical algorithm which can later be converted to slightly different program code.

-Quick response when generating numerical values.

-Sequence of numbers can be reproduced.

-Sequence of number is repeated.

True Random Numbers:

-Extract randomness from physical phenomena and introduce into a computer.

-Slow response when generating numerical values.

-Sequence of numbers cannot be reproduced.

-Sequence of number is not repeated.

1. **Is atmospheric noise truly random?**

Many PRNGs(Pseudo Random Number Generators) say that one of the ways to get true randomness is via processing atmospheric noise. However, atmospheric fluctuations are not truly random, they're just extremely chaotic and unpredictable.