CO-207

Name: Sandesh Shrestha
Roll no: 2K21/CO/417
Batch: A6

"Modelling and Simulation"

Contents:

→ #Tutorial 1 4 questions

Submitted to:

Ms. Dipika Jain

modelling and simulation

Tutorial - 1

Question no. 1

What do you understand by simulation, give a real life example?

→ A simulation is a model that mimics the operation of an existing or proposed system, providing evidence for decision making by being able to test different scenarios or process changes. A simulation imitates the operation of real world processes or systems with the use of models. It is the re-creation of a real world process in a controlled environment. Simulations are typically conducted in a controlled environment that allows for modification or adjusting of variables as needed. Simulations work by developing models or systems to recreate real-world scenarios. A model refers to any setup, device, or representation used to describe or simulate a process when it cannot be experienced directly. The ability to modify and re-test a virtual design means you don't have to spend time (or money) building and testing multiple prototype iterations. You can settle on a design that satisfies the requirements in simulation before building an actual prototype.

Real-life examples of simulations include solar activity models, highway and street traffic models, war models, social and behaviour models, etc.

- Telecommunications: designers of 5G telecom equipments use simulation to design everything from base to antennas for maximum range to determine the placement of base stations. Designers also test new communications protocols by modeling base stations, mobile devices.

• geology: By understanding the mathematical relas among various types of soils, rocks and subterran structures, geologists and seismologists can use simulation to predict the effects of different types of earthquakes on amount of surface shaking that would occur.

Question no. 2

~~what do you~~ differentiate between deterministic and non-deterministic simulation event.

deterministic	non-deterministic
→ A simulation event is deterministic if its behaviour is entirely predictable.	→ A simulation event is non-deterministic if it has random variables as inputs and consequently also its outputs are random.
→ Deterministic simulation event/function always returns the same results if given the same input values.	→ A non-deterministic simulation returns different results everytime it is called, even when the same input values are provided.
→ Deterministic model does not include any randomness at all. Everything happens strictly with infinite accuracy according to original plan.	→ A non-deterministic model allows random variation in its probabilistic events resulting in an ever-changing system where the future is predictable only with limited accuracy.
→ A deterministic model allows to calculate a future event exactly without the involvement of randomness.	→ It has the capacity to handle uncertainties in the inputs applied.

→ variables are the functions of time only.	→ variables depend on time and probability.
→ Trajectory is fixed between simulations.	→ variability between simulations
→ examples: solve a system of differential equations representing a chemical reaction, simulation of a digital circuit, etc.	→ examples: queuing models, amount of time required to service a customer, etc.

Question no. 3

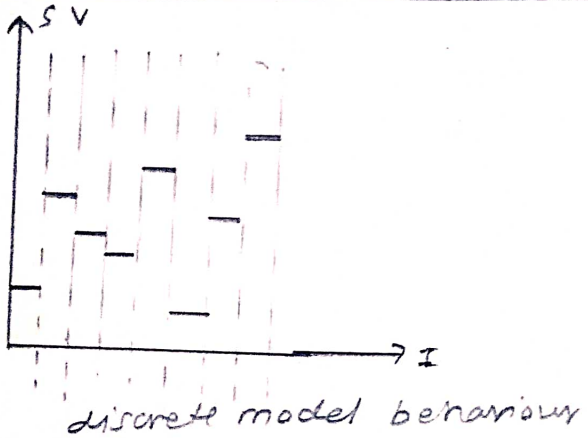
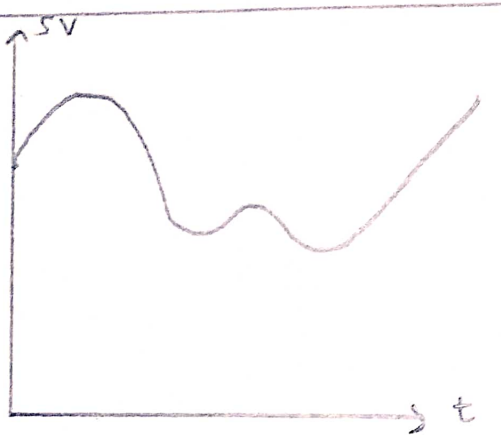
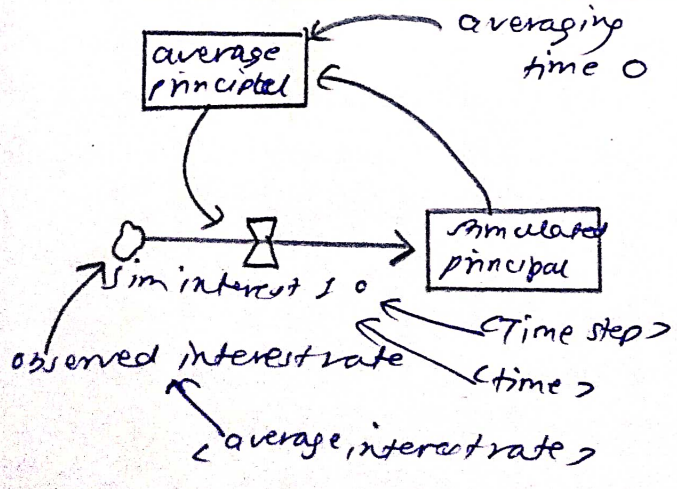
what do you understand by entity, system and how do these two terms form a relationship to perform simulation?

→ System is defined as a set of ideas or rules for organizing something; a particular way of doing something. System is the articulate object under definite conditions, which exists in the real world. It is a group of objects that are joined together in some regular interaction or interdependence towards the accomplishment of some purpose.

Entity is an object of interest in a system. Individual elements of the system that are being simulated and whose behaviour is being explicitly tracked. They are the dynamic objects in simulation. Each entity can be individually identified. Most entities represent real things in a simulation. A system is defined to be a collection of entities eg: people or machines, that act and interact together towards the accomplishment of some logical end.

an entity is an object of interest in the system where a system is defined to be collection of entities. Pair of non-similiar entities may be related. Eg:- A busy pump is related to the auto that is being served. Relationships can be indicated by including in the record for one of the entities in a pair linked to other entity.

4) differentiate between discrete and continuous system.

discrete	continuous
→ The state variables change only at a countable number of points in time. These points in time are the ones at which the event occurs / change in state.	→ The state variables change in a continuous way, and not abruptly from one state to another (infinite number of states.)
→ Time changes in incremental steps.	→ Time changes continuously.
→  discrete model behaviour	→  continuous model behaviour
→ made up of entities, attributes and events	→ changes expressed in terms of differential equations.
→ examples: queuing system, inventory models, machine shop models, etc.	→ examples: econometric models, system dynamics, classical mechanics, etc.
→ 	→