**Class Home Assignment #1**

**Q.1 What is modeling?**

Modelling is the process of producing a model. A model is defined as a simple and scaled representation of actual system. A model is generally used in mathematical form for simulation studies. In model input and output variable can be deterministic, stochastic, static, or dynamic. After successful preparation of model, given model is validated against given inputs and outputs variable.

**Q.2 What is simulation?**

Configuring/experimenting with the actual system is impossible and expensive, for this reason configuring/experimenting is done on the model and this operation on model is called simulation. By simulation performance of system under different inputs can be evaluated.

Before the construction and working of existing system or new system simulation studies are done to reduce the chances of failure, time cost and money utilization, and increase the efficiency of the system.

**Q.3 What is simulation modeling and analysis?**

Simulation modelling and analysis is the process of creation of the system, configuration of model and analysis of the outputs of the model.

Typically in simulation modeling and analysis, problem/system is identified first, than the problem is formulated and real world date is collected (input variable). Different inputs are classified into different classes depending on the nature of inputs(deterministic/stochastic). For the purpose of classification of the input variable, statistical studies are done on input variable. After classification of inputs, mathematical model is developed and configured with different conditions and validated against known inputs and outputs.

**Q.4 What types of problems are suitable for simulation?**

If the construction of real system is expensive or impossible, simulation is preferred way to analyze the system. Also, if the analytical solution of mathematical model cannot be developed, simulation can be used to calculate the output at different input and to analyze the working of the system. Lastly due to insufficient real system data, if it is impossible to validate the system simulation modelling and analysis can be done.

**Q.5 How to select simulation software?**

Those Simulation software are considered good for modelling and simulation which have flexibility of simulating the model in all real system problem sense and gives good representation of the output of the system.

Simulation software choose should be easy to use, flexible, having good documentation, collecting the statistics of system automatically, good animation, rendering, and flexibility in addition of new custom codes to inbuilt library.

**Q.6 What are the benefits and pitfalls in modeling and simulation?**

Benefits of simulation modelling and analysis are:

* Time cost for the creation and testing of real system is minimized
* Money utilization for the construction and testing the performance of system is reduced.
* Gives an understanding of system under different input variables.
* Optimization of system under different condition can be evaluated.
* Can test a system under conditions which can only be obtained rarely in real world.

Pitfalls of modelling and simulation are:

* Simulation model are not exact representation of real system but a simple model based on some assumption.
* Simulation and modelling highly depends on the skill set of the user preparing it. Any error made by user will highly impact the simulation.
* Assumption made may be erroneous.
* Every assumption should be documented.
* Using wrong distribution for input variables.