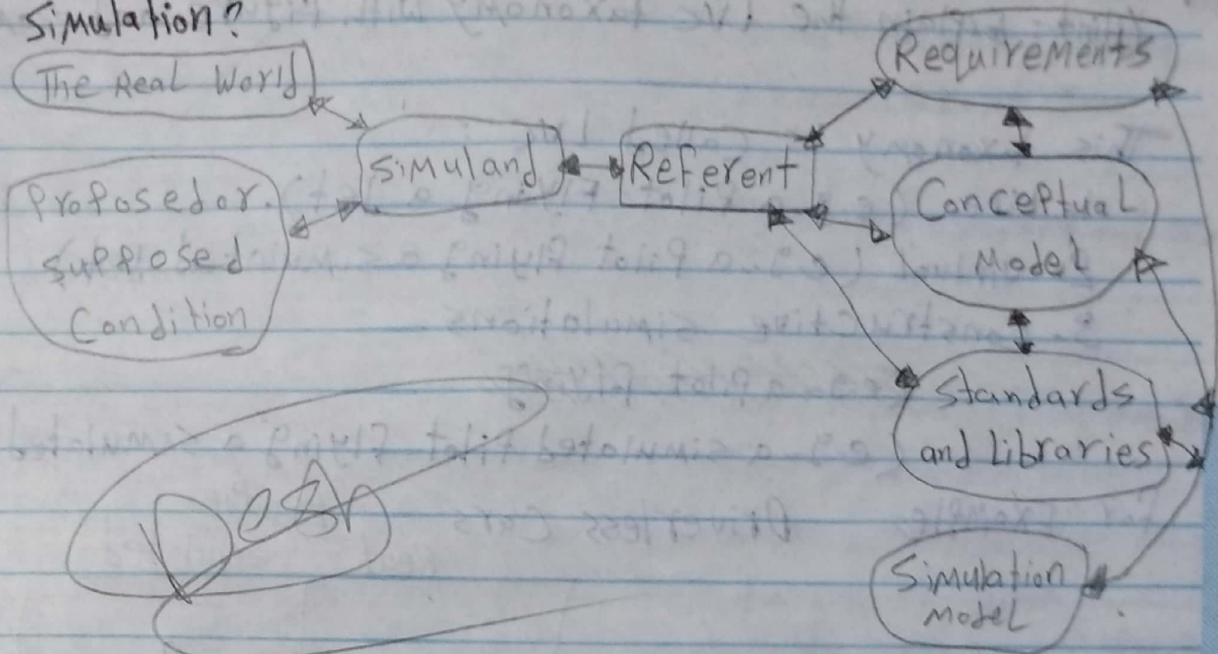


1- Define the following terms:

- **Model** is a physical, mathematical, or otherwise logical representation of a system, entity, phenomenon, or process
- **Simulation** is a method for implementing a model over time
- **MBS** is the discipline that comprises the development and/or use of models and simulation
- **Simplification** is an analytical technique in which unimportant details are removed
- **Abstraction** is an analytical technique that establishes the essential features of a real system and represents them in a different form
- **Simulation Plan** The simulation project plan is a document that includes time to be required - people to be used - hardware - software - output at each stage - cost of the study
- **Verification** is the process of determining that a model or simulation implementation and its associated data accurately
- **Validation** is the process of determining the degree to which a model or simulation and its associated data are an accurate
- **Conceptual model** is an abstraction of the real-world system under investigation
- **Simulation Conceptual Model** is a living document that grows from an informal description to a formal description
- **DES** A discrete-event simulation (DES) is characterized by changes in the simulation's state at discrete time points
- **M&S fidelity** The accuracy of the model or simulation when compared to the real world
- **Dynamic system** is a collection of different parts that work together to transform some input into the system.

2- Discuss in detail the relationship of system, Model and Simulation?



3- The Simulation Conceptual definition state that:

$$\text{Simulation} = \text{Model} + \text{Data} + \text{Method} + \text{Implementation} + \text{Realization}$$

Ex Plain these Concepts in brief with example?

Model → is a physical, mathematical or otherwise logical representation of a system, entity, phenomenon or process

Data → represent model inputs and are constrained so that the combination of model plus data results in a unique solution independent of method.

Method → There are different numerical methods that may be used to solve the model's equations.

Implementation

Realization → Model realization is the final act in the modeling process

Ex Estimate the area under a curve.

Solve Model equation include: interpolation
extrapolation

4- How users Interact With Simulations?

(Hint: Explain the LVC taxonomy with figure and examples)

This taxonomy is called LVC :

- 1- Live (e.g. a Pilot Flying a Jet).
- 2- Virtual (e.g. a Pilot Flying a simulated Jet).
- 3- Constructive simulations

~~(e.g. a Pilot Flying)~~

(e.g. a simulated Pilot Flying a simulated Jet)

For Example Driverless Cars People

Real Simulated

SYSTEMS	Real	Live	?
	Simulated	Virtual	Constructive

[Handwritten signature]

5. In your opinion, which one of the steps in the Modeling and Simulation Life Cycle Process do you consider the most important? Explain and give a reason about your choice.

The Conceptual Model making step is the most important as it describes the idea behind the system.

Develop Documentation is a very important part in Simulation Process. It defines how simulation model operates.

- ⊙ all simulation inputs are documented
- ⊙ specified units or dimension of data
- ⊙ identified all simulation interfaces and format of all input data

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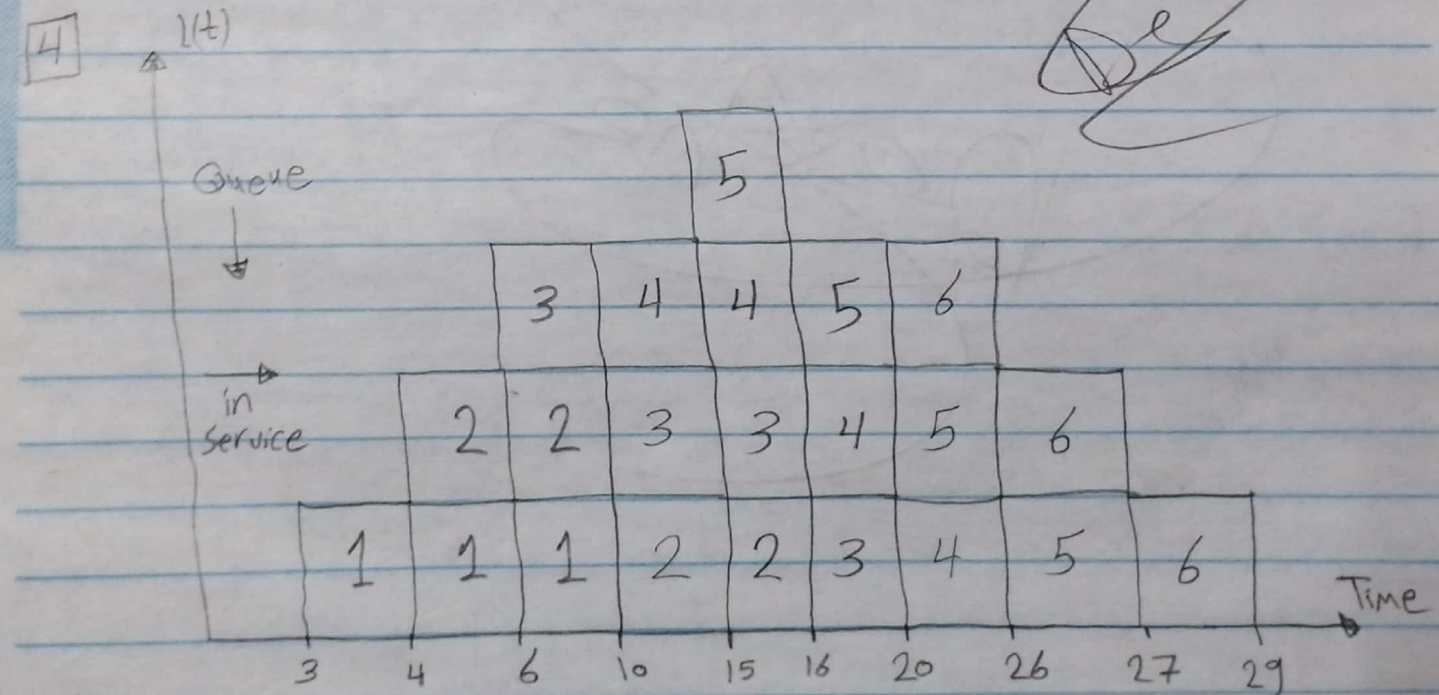


* WLB

6	4:03	7	4:04
3	4:06	4	
4	4:10	6	
5	4:15	1	
6	4:20	2	

A_i	T_i	W_i	S_i	D_i
1	4:03	0	7	4:10
2	4:04	6	6	4:16
3	4:06	10	4	4:20
4	4:10	10	6	4:26
5	4:15	11	1	4:27
6	4:20	7	2	4:29

2 $W_{avg} = \frac{0+6+10+10+11+7}{6} = 7.33$



*

3

Time	Event	$L(t)$
4:00	Simulation begins	0
4:03	Customer 1 arrives	1
4:04	Customer 2 arrives	2
4:06	Customer 3 arrives	3
4:10	4 arrives, 1 departs	3
4:15	5 arrives	4
4:16	2 departs	3
4:20	6 arrives, 3 departs	3
4:26	4 departs	2
4:27	5 departs	1
4:29	6 departs, simulation ends	0

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7-In simulation we typically focus on: objects, behavior interactions, environment, and time. Explain in brief with example

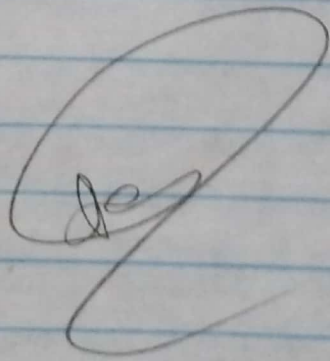
- objects refer to the individual components of the system or process of interest
- objects have behavior which defines their action and activity over time
- an interaction is any action taken by an object
- the environment refers to the notion of place where objects are located

*

- The environment refers to this place
- Clock maintains a local notion of time and coordinate time between each event

8-Discuss in detail the use of models and simulation in systems engineering?

Simulations can be used to design and implement a system effector by exploring feasibility of new concepts.



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(Aban K)

فکله من علها آست

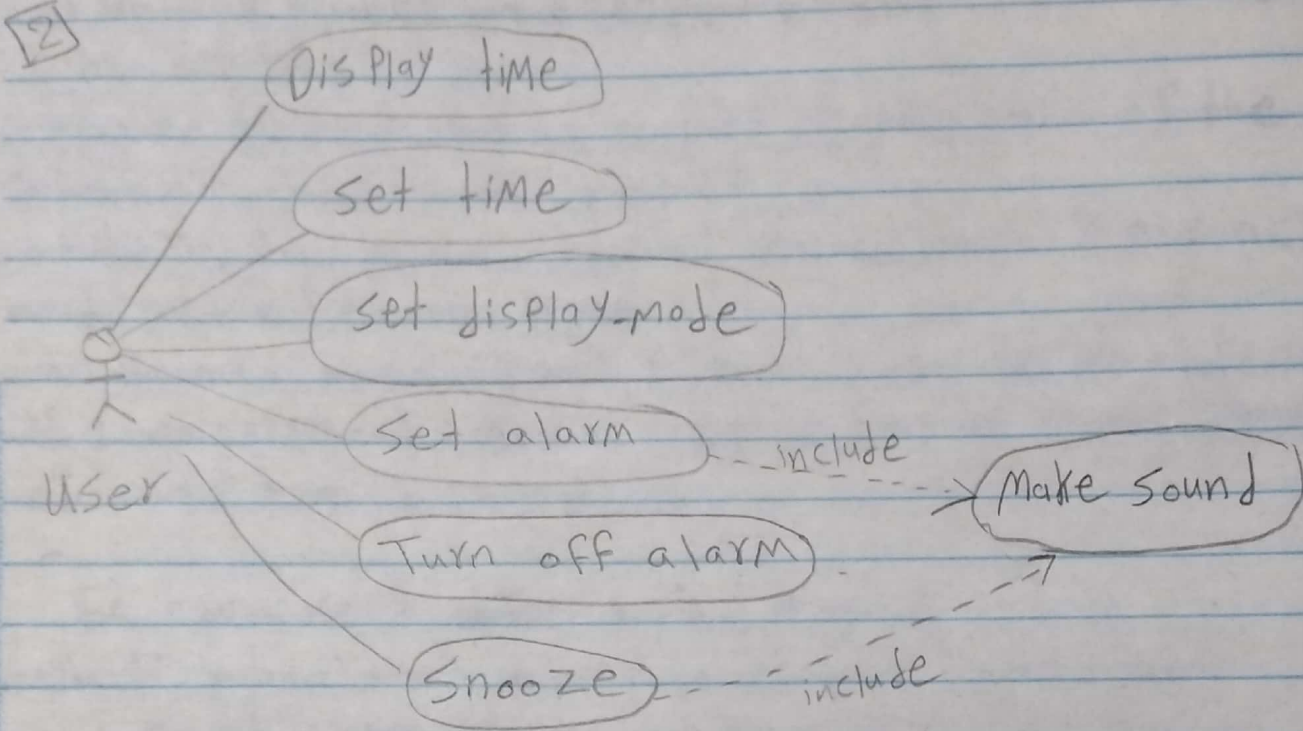
فکله من علها آست

- a) A bank is planning its requirements for ATMs (automated teller machines) in a new branch. Three types of ATM can be purchased: general ATMs (giving cash, balances, mini statements and PIN change facilities), ATMs for paying money into accounts and ATMs that provide full account statements.

Develop a conceptual model for this problem outlining:

1. The objects, processes (Process Name, Start, End, and Effect) and relations.
2. Three different Use Cases (Giving Cash, PIN Change, and Paying Money into Account) using Use-Case Diagram.

9- The clock



- II
- Set the hours and minutes fields
 - Choose between 12 and 24-hour display
 - Possible to set one or two alarms
 - It will sound some noise when an alarm fires
 - Turn off by user or snooze
 - The alarm will turn off itself after 2 minutes

Most of the set keys

A large, abstract, scribbled mark on lined paper, possibly a stylized signature or a large letter 'S'. The mark is drawn with a dark pen and consists of several overlapping loops and curves. It starts with a vertical line on the left, curves around to the right, and then loops back down and to the left, ending in a long, sweeping curve that extends towards the bottom right corner of the page.

