MODELLING AND SIMULATION

→ Subset of operation and research
→ MODEL → any formula can be model
→ SIMULATION → set of models required to solve
          problem in given constraints
* Model ⊂ Simulation
* Simulation uses a physical thing. Model is restricted to copy
→ TYPES OF SYSTEM
    (i) Static: provides one service at one instance of
               time
    (ii) Dynamic: multiple services at multiple instances
   eg. of Simulation:
   In budget calc, we compare current budget with
   aggregate of previous years. This requires
   Simulation.

* DISADVANTAGES OF SIMULATION
   (i) Expensive, so can be used by big ventures and
      not small ventures.
   (ii) Single input. so output may have error.

* ADVANTAGES OF SIMULATION
   (i) Human Resource mgmt

TYPES OF SIMULATION:
(i) Discrete → open an account in a bank
(ii) Continuous → open account then open FD, then deposit
            money etc.

* STEPS UNDER SIMULATION
   (i) Entity
   (ii) Business demand
   (iii) Business variables
   (iv) External Factor / Internal Factor

260	324
90	100

→ QUEUEING MODEL :

$\mu \rightarrow$ time after which a person moves ahead in queue / service time

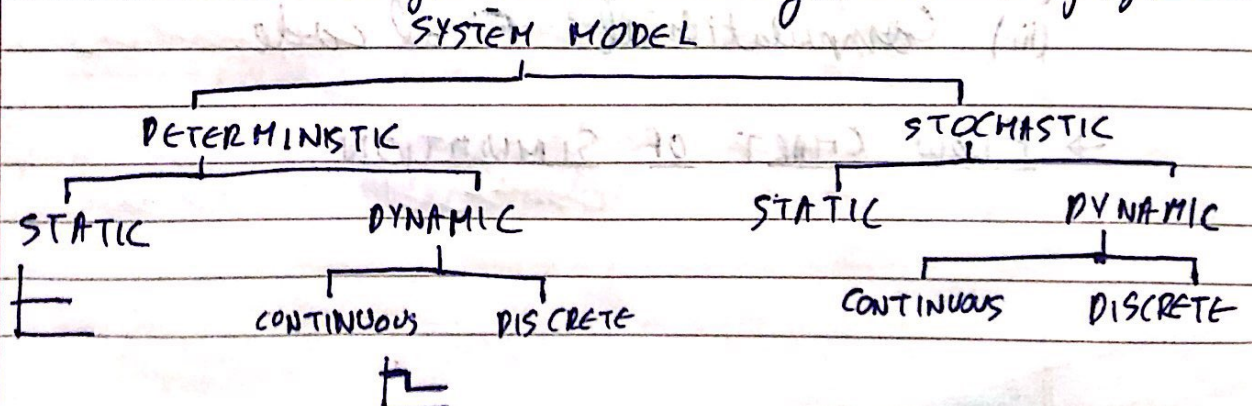$\lambda \rightarrow$ time b/w start and end of queue

→ COMPONENTS OF A SYSTEM

(i) ENTITY: An object of interest in the system.

(ii) ATTRIBUTE: A property of an entity.

(iii) ACTIVITY: A time of specified length

(iv) STATE: The collection of variable necessary to describe the system at any time. relative to the object of the study.

(v) EVENT: An instantaneous occurrence that may change the state of system

(vi) ENDOGENOUS: To describe activities and events occuring with in the system

(vii) EXOGENOUS: To describe activities and event in an environment that affect the system

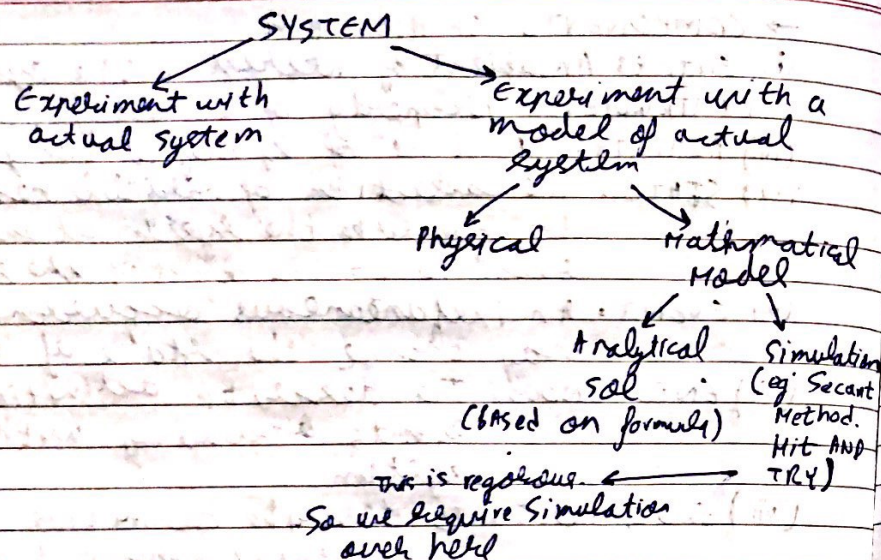* Collectively, they become model

eg →

SYSTEM	Attribute	Activities	State variable
(i) Bank ↓ ENTITY	checking ↓ deposit ↓ MAJOR AIM OF QUESTION/ SYSTEM	Arrival ↓ Departure ↓ SUB-TASKS REQUIRED TO ACHIEVE THEM	Number of busy tellers Number of customer waiting ↓ DATA MAINTAINED

EVENT: eg: If bank manager says account doesnot have money, so this changes state of system.

→ SYSTEM MODEL

```
                    SYSTEM MODEL
          ┌──────────────┴──────────────────┐
     DETERMINISTIC                       STOCHASTIC
      ┌──────┴──────┐              ┌──────────┴──────────┐
   STATIC        DYNAMIC        STATIC               DYNAMIC
    └┬          ┌───┴───┐                         ┌─────┴─────┐
        CONTINUOUS  DISCRETE              CONTINUOUS      DISCRETE
          ┌┴
```

SYSTEM

Experiment with actual system

Experiment with a model of actual system

Physical   Mathematical Model

Analytical sol   Simulation
(based on formula)   (eg: Secant Method. HIT AND TRY)
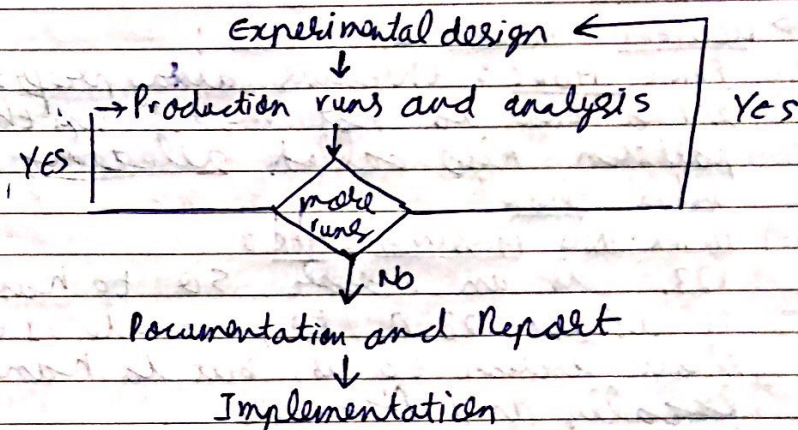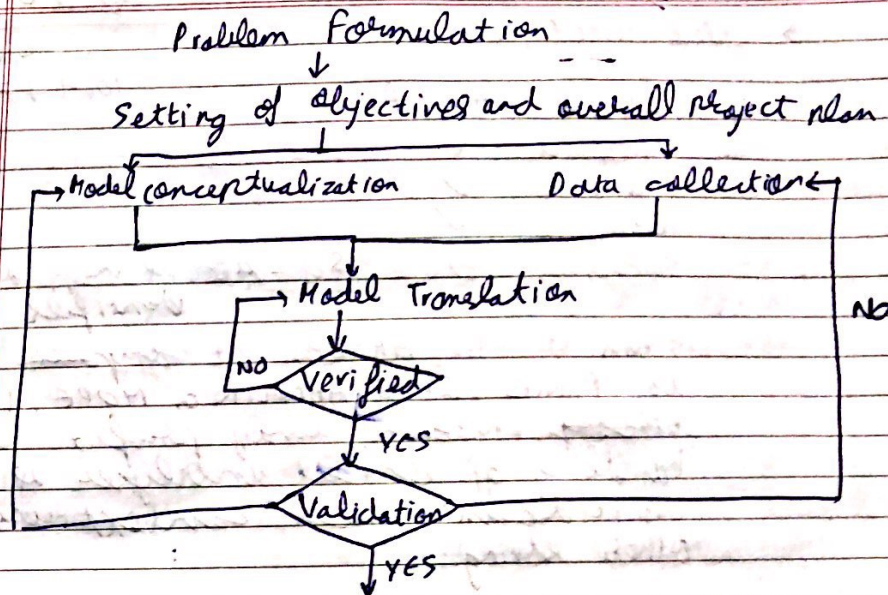
This is regorous. So we require Simulation over here

→ **HOW TO DEVELOP A MODEL:**
(i) Build a conceptual Model
(ii) Convert it into specification model i.e close to our desired target specifically or not
(iii) convert into computational model i.e simulation
(iv) Verify
(v) Validate

→ **3 - MODEL LEVEL:**
(i) Conceptual : state variables
(ii) specification : Pseudo code
(iii) Computational : Final code.

→ **FLOW CHART OF SIMULATION**

Problem Formulation
↓
Setting of objectives and overall Project plan
↓
Model conceptualization   Data collection
↓
Model Translation
NO → Verified
↓ YES
Validation
↓ YES
Experimental design
↓
Production runs and analysis   Yes
↓
more runs
↓ No
Documentation and Report
↓
Implementation

NO   No
YES

LEXICAL ANALYZER

fi (a = 6) → bracket open
→ bracket close
→ identifier → end operator