

## OR 441: Simulation and Modeling

### Tutorial Handout #2: Introduction to Simulation

#### Q.1

Define

1. Manufacturing system (TV manufacture)
  2. Transportation system (Train System)
  3. Health-Care system (a Clinic)
  4. Service system (Call Center)
- a. For each of the system find:**
1. System Inputs
  2. System Components/Elements
  3. System Outputs
  4. System Environment/ Boundary
- b. Find the state, entity, the attributes of the entities?**

#### Q.2:

Consider a **two-line** customer service call center

- If line is idle, any new call is accepted
- If line is busy, any new call is lost

call#	Arrival time	Service time		call #	Arrival time	Service time		call #	Arrival time	Service time
1	2	3		11	29	1		21	54	5
2	3	8		12	30	3		22	55	2
3	4	3		13	31	4		23	57	5
4	5	3		14	32	2		24	58	3
5	10	3		15	33	4		25	59	6
6	14	2		16	36	13		26	60	2
7	17	1		17	38	4		27	61	3
8	18	4		18	43	1		28	63	2
9	20	1		19	48	1		29	65	1
10	23	3		20	50	3		30	66	2

Do the discrete-event simulation and Complete the details of the calls center and compute:

1. Define the events of the system
2. The lost calls probability
3. Percentage of time **line-1** is busy
4. Average arrival rate
5. Average service time

**Q.3:**

Consider a parking lot with **three** parking spaces:

- If a space is available, any new car is accepted
- If all spaces are full, any new car

car #	Arrival time	Parking time
1	2.00	4.00
2	5.00	5.00
3	13.00	2.00
4	17.00	4.00
5	18.00	2.00
6	19.00	6.00
7	21.00	11.00
8	23.00	3.00
9	28.00	12.00
10	31.00	2.00
11	33.00	8.00
12	35.00	2.00
13	37.00	2.00
14	39.00	13.00
15	40.00	4.00
16	42.00	4.00
17	46.00	11.00
18	48.00	12.00
19	50.00	12.00
20	51.00	6.00

Do the discrete-event simulation and Complete the details of the parking lot:

1. Define the events of the system
2. The lost cars probability
3. Average arrival rate
4. Average parking time
5. Probability empty parking (No one in the parking)