IEGR 410: Discrete Event Simulation
M. Salimian
Summer 2017

Homework No. 1 (100 points)

Due: 5:00PM Friday July 14, 2017

Problem Statement

WCU radiology is located adjacent to a large hospital. It has two units of identical X-Ray machines. The hospital has contracted WCU services for its last hours of operation during each business day to send 40 patients for X-Rays. The first patient arrives at time zero. WCU will finish any patient work if at the end of its regular business hours patients are still in the queue or being X-Rayed.

Patients have already pre-registered through hospital system which X-Ray technician has access to and can see the ordered procedure. Upon arrival, if one of the X-Ray units is idle, the patient will go directly to that unit for service. If both are idle, X-Ray unit number two will provide service. When both units are busy, patients will wait until one of the units becomes available. Patients receive service based on FIFO priority rule.

You may work individually or with a partner. If you prefer to work with a partner, your number of patients is 57.

The attached table represents the data of patient inter-arrival times and the needed service time both for 40 patient and 57 patient cases.

Perform a hand simulation until all patients complete their work. Generate and gather the following information:

1. Plot # of patients in the system versus time.

2. Plot # of patients in the queue versus time.

3. Calculate the average waiting time of the patients in the system and in the queue.

4. Calculate the percentage of the time each unit was busy (utilization).

Represent the data for hand simulation in a table similar to the one presented in the class.

Due to considerable waiting time, WCU management is considering to upgrade the first unit to a newer and more efficient model that reduces the processing time by 1 minute for each patient. Perform the hand simulation for the new condition and compare the new result (1-4 above) with the first case. In a paragraph argue and explain how WCU management can justify the investment into the new machine using the results of the two simulations.

IEGR 410: Discrete Event Simulation
M. Salimian
Summer 2017

Patient Number	Inter-arrival Time	Service Time
1	a	12
2	b	9
3	c	14
4	3	10
5	d	9
6	e	8
7	4	12
8	6	15
9	5	11
10	7	9
11	8	11
12	6	13
13	6	8
14	9	10
15	5	9
16	1	10
17	8	8
18	5	15
19	4	9
20	7	13
21	4	8
22	6	9
23	5	9
24	8	14
25	3	9
26	4	5
27	3	7
28	6	12
29	3	11
30	5	10
31	9	6
32	5	13
33	6	10
34	2	9
35	7	12

36	4	4
37	7	2
38	5	9
39	4	13
40	5	9

41	6	13
42	7	1
43	2	8
44	4	12
45	6	9
46	5	11
47	3	10
48	4	7
49	6	9
50	5	14
51	2	9
52	6	8
53	8	7
54	3	4
55	7	6
56	3	4
57	6	4

In the above table a, b, and c are the last 3 non-zero digits of your phone number. For example, if your phone number is 443-885-3070, then a = 5, b = 3, and c = 7. Similarly, d and e are the last two digits of the year of your birth. For example, birth year of 1996 will lead to d=9 and e=6. If one of the digits of the birth year happened to be 0, then you would replace it with 4.