Title:

Introduction to Simulation and Modeling

HW3

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Introduction:

In this homework, we have tried to simulate three different simulation scenarios by using CSIM library.

For each part a make file is existence that you can use in order to compile the source code.

Part0: The code is submitted.

Part1:

1- The simulation results is generated based on different values of λ_1 and λ_2.

Simulation Parameter	Value
λ_1 (High priority)	0.1,0.5
λ_2 (low Priority)	0.2,0.3,0.4,0.5
Mean service time	1
Number of customers	2000

From simulation results that are shown in Figures 1 to 10 we understand the when λ_1 is fixed and λ_2 is increased, average number of high priority and low priority customers and average delay of low and high priority customers is increased as well. When λ_1 is increased to 0.5, trend of results is the same as before but slop of line graph is higher when compared with $\lambda_1 = 0.1$

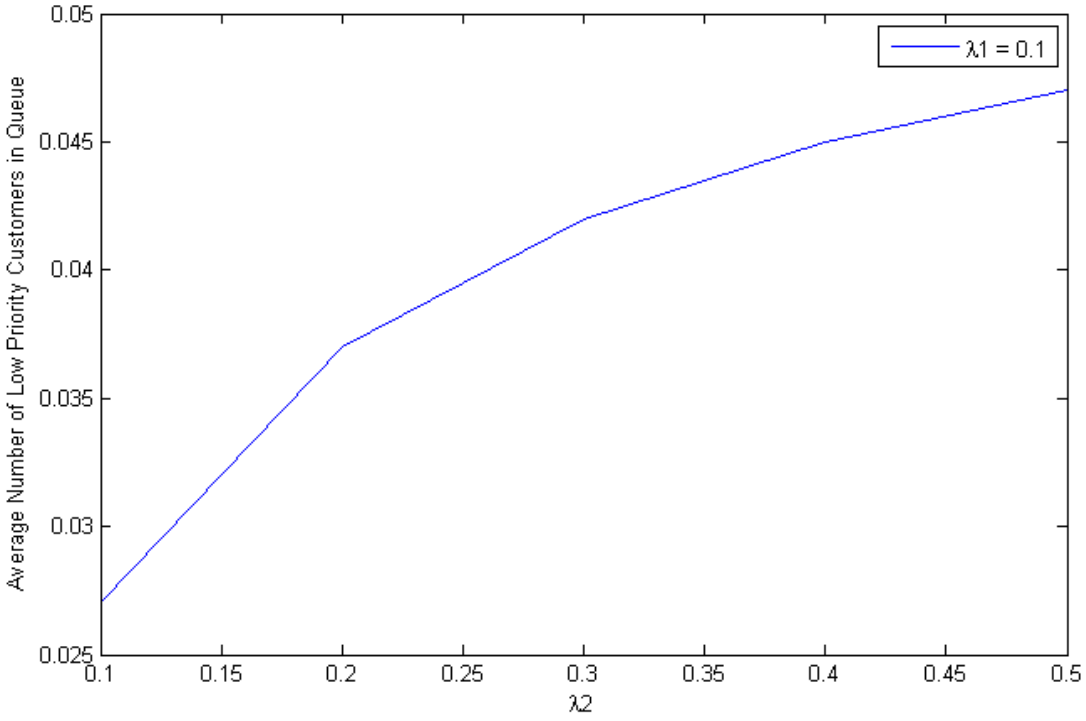

Fig 1. Average Number of Low priority customers in Queue vs. different values of λ_2

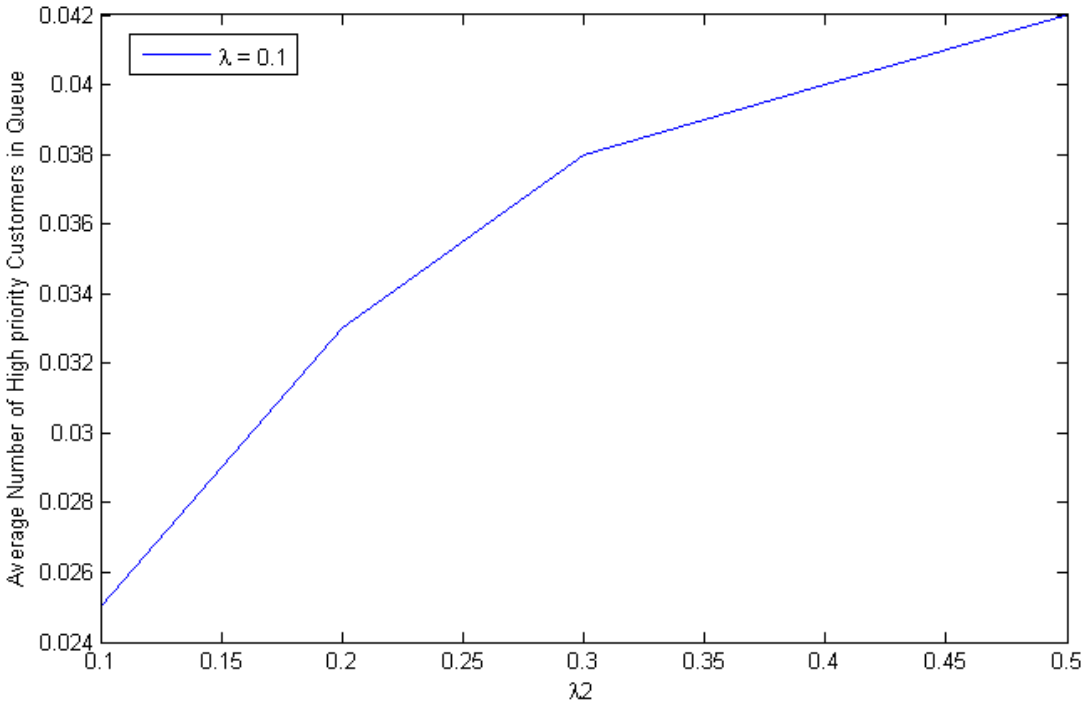

Fig 2. Average Number of High priority customers in Queue vs. different values of λ_2

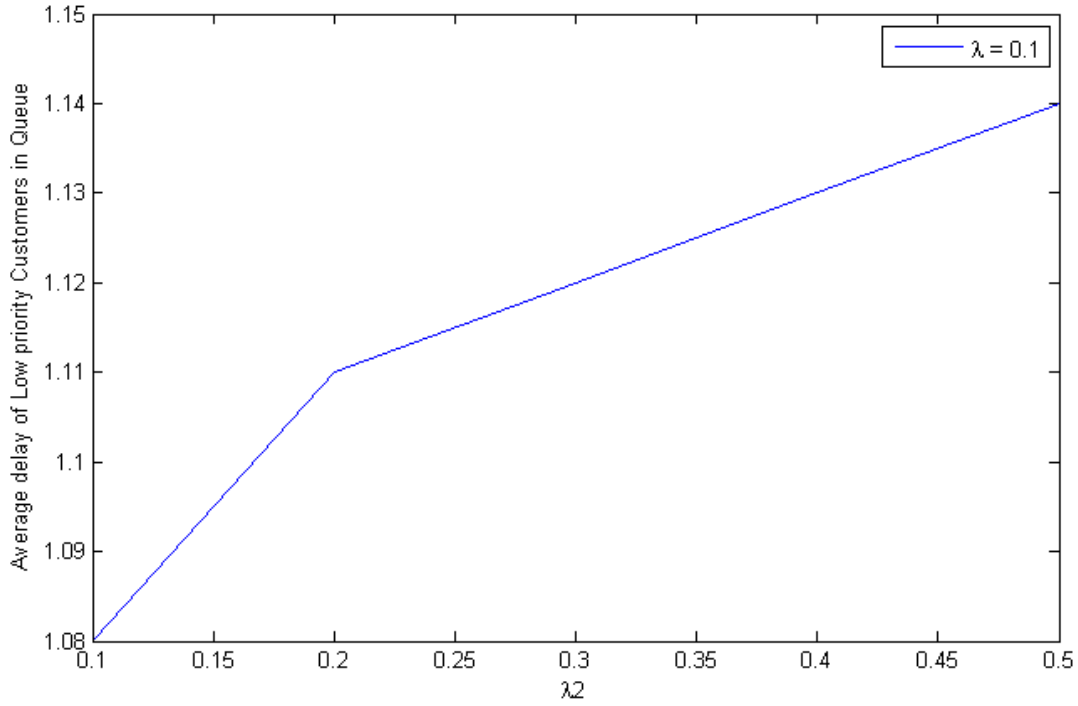

Fig 3. Average delay of low priority customers in Queue vs. different values of λ_2

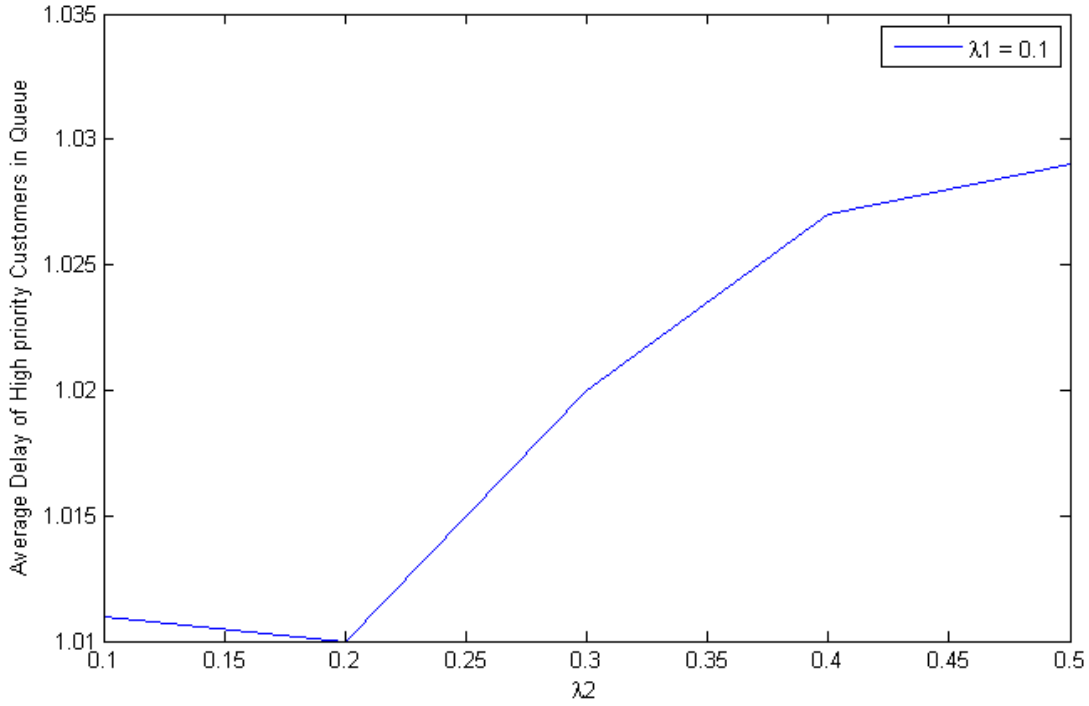

Fig 4. Average delay of High Priority Customers in Queue vs. different values of λ_2

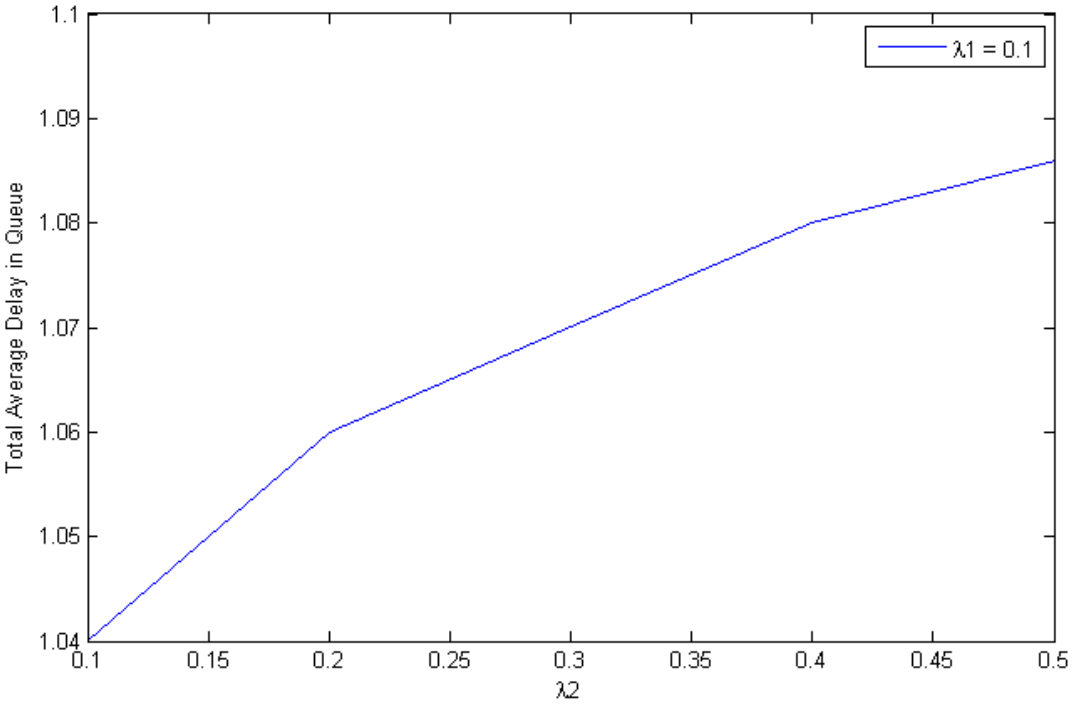

Fig 5. Average delay in Queue vs. different values of λ_2

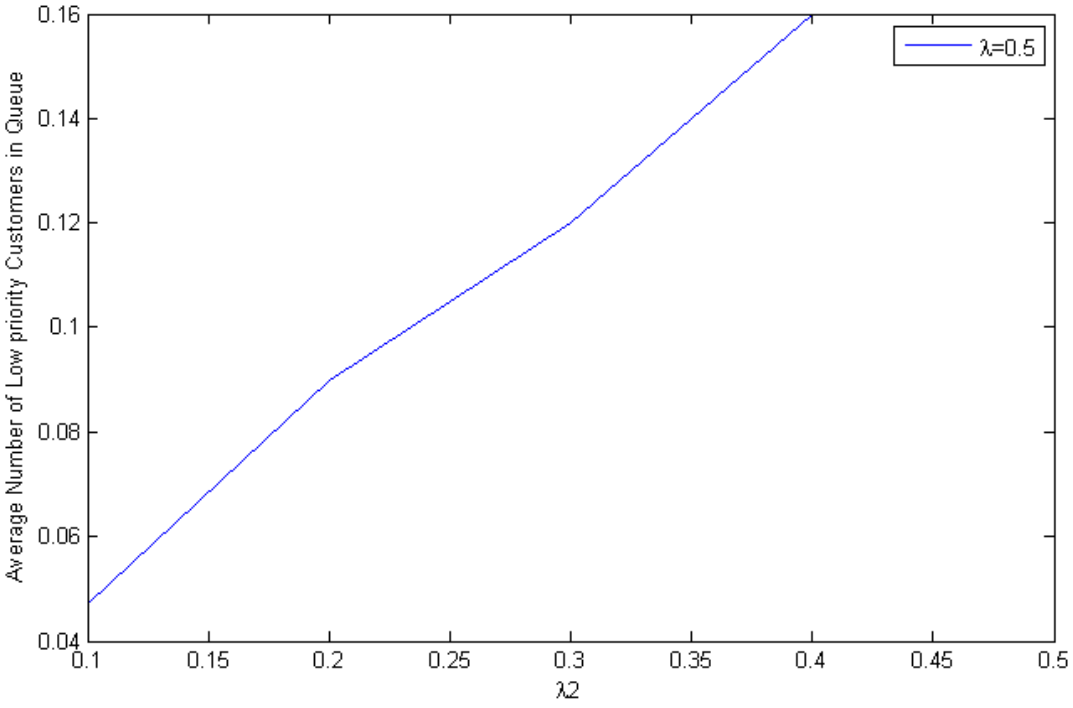

Fig 6. Average Number of Low priority Customers in Queue vs. different values of λ_2

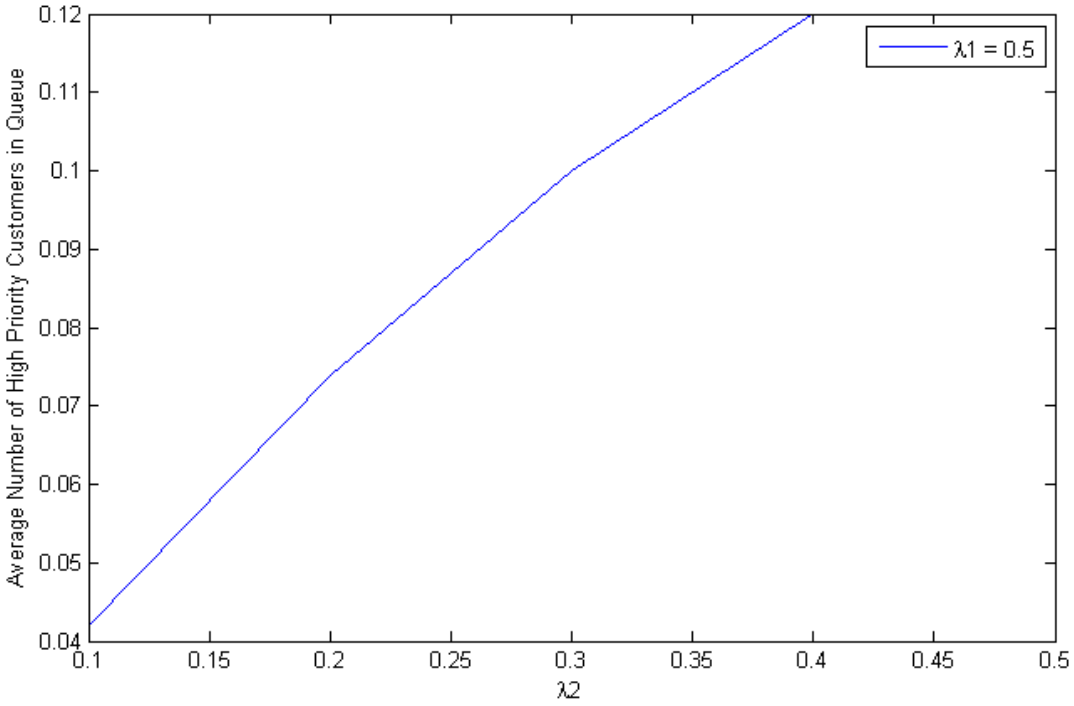

Fig 7. Average Number of High priority Customers in Queue vs. different values of λ_2

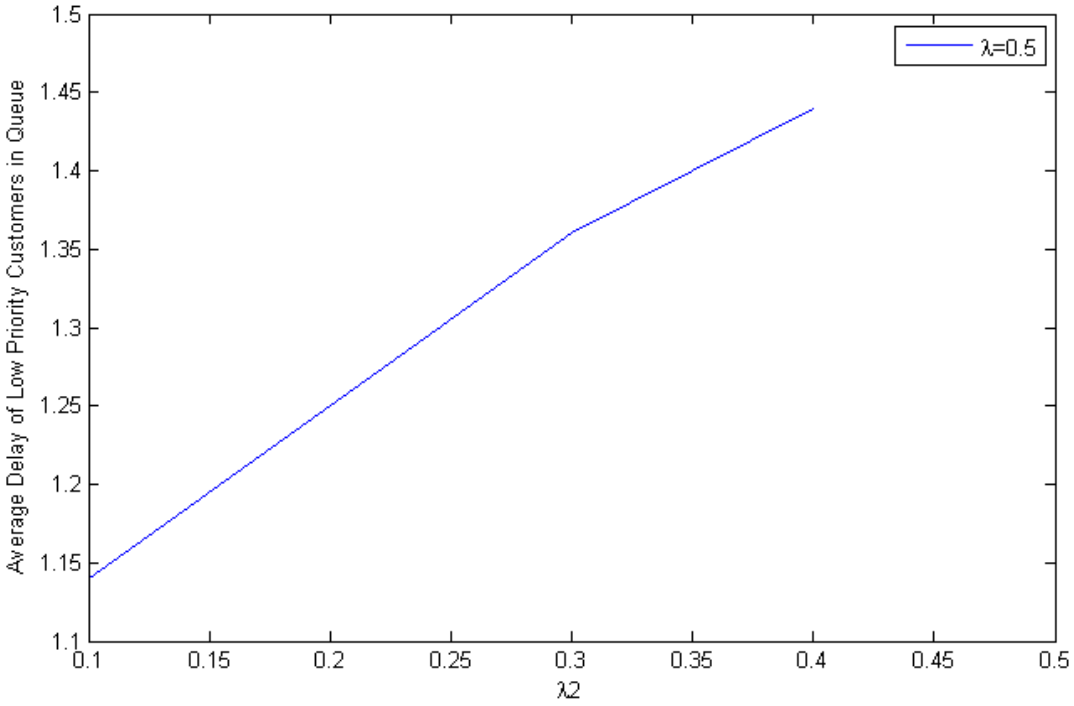

Fig 8. Average Delay of low priority Customers in Queue vs. different values of λ_2

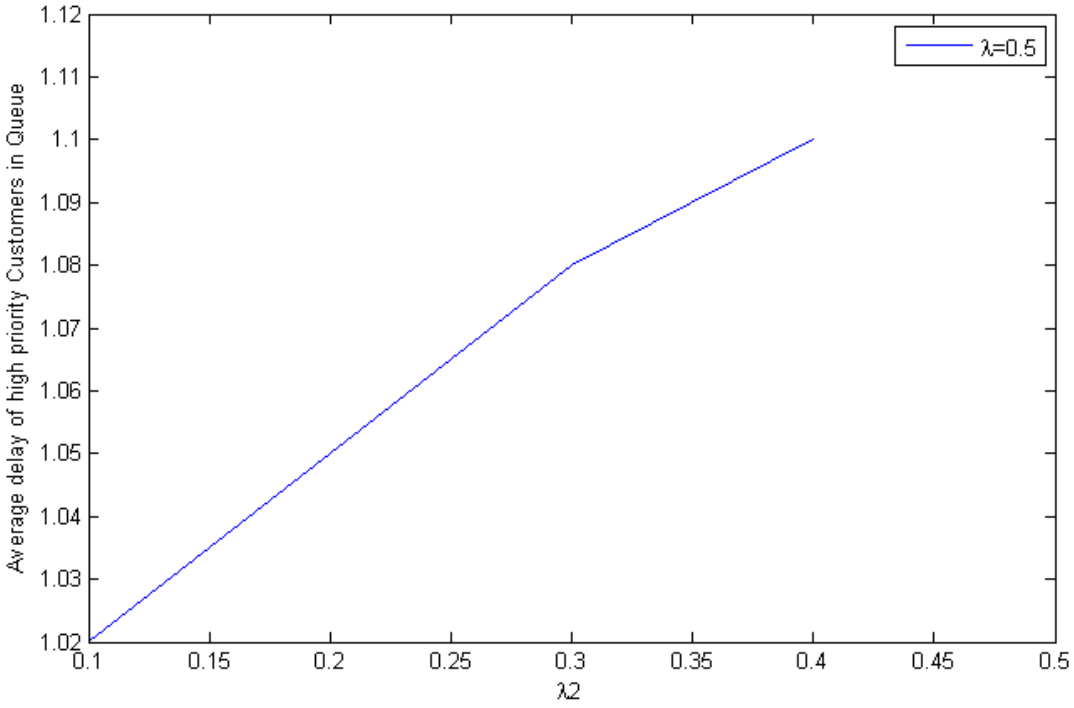

Fig 9. Average Number of High priority Customers in Queue vs. different values of λ_2

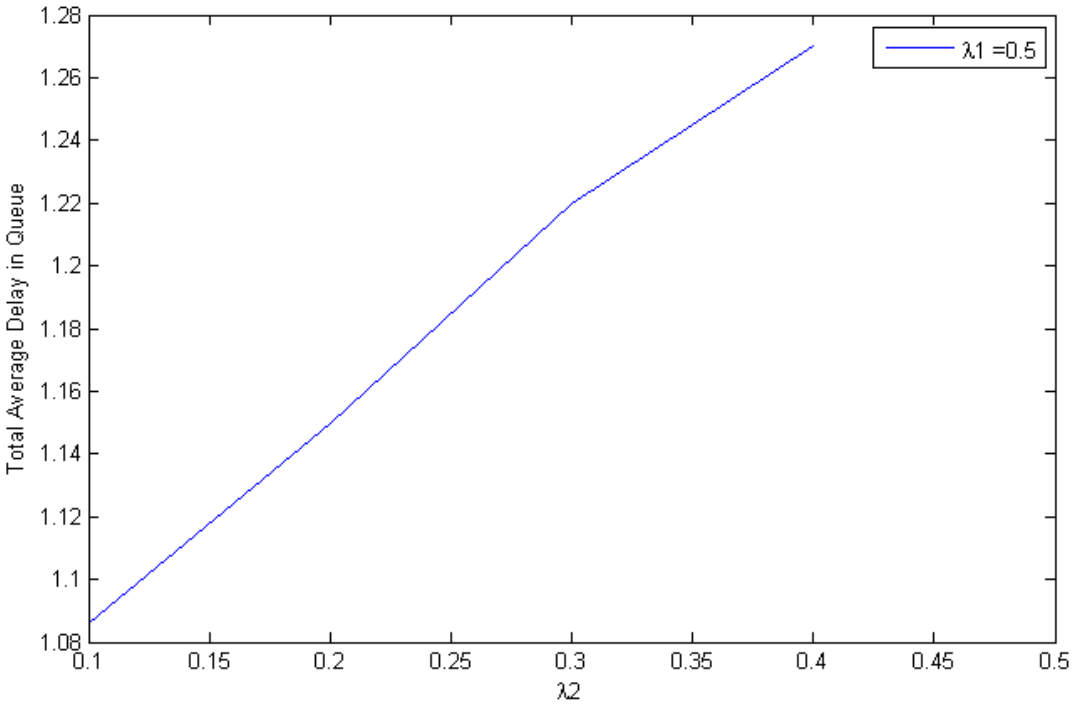

Fig 10. Average delay in Queue vs. different values of λ_2

Part2:

2- We have simulated 100 orders in CSIM (after execution of program the results is saved in part2.out). In my design I have supposed that each of the production and packing departments is a facility in order to collect report from each of them.

Question1: Simulation Results show that 23 of 100 orders are lost.

Question2: Utilization of packing machine is 74 percentages and utilization of production machine is 0.16 percentages. In addition, utilization of storage is 0.893.

Question3: Average number of customers in production queue and packing queue are 0.16577 and 1.16339 respectively. Simulation results show that 35 customers is queue in storage.

Question 4: Simulation time is 26785. Average waiting time in packing machine is 577.07419 and average waiting time in production unit is 82.22.

Part3:

3- In this part, we have simulated traffic light scenario for different values of GREENA and GREENB in order to find optimal values. In source codes, GREENA and GREENB are represented by green1 and green2 variables. In order to find minimum waiting time, response times for both of directions (A to B and B to A) are compared with each other. In other words with changing the values of GREENA and GREENB we have tried to find optimal points in which delay from A to B and B to A will be minimum.

Values (greenA-greenB)	A to B (delay)	B to A (delay)	average
80sec – 60sec	757.33	764.33	760.83
50sec – 60 sec	52.31	62.06	57.185
45sec – 60 sec	47.29	62	54.645
30sec-60 sec	32.29	62	47.145
60sec-45sec	54	62	58
60sec-50sec	62	54	58
60sec -30sec	62	39	50.5
60sec- 80sec	737.33	764.33	750.83
45sec- 50sec	47	52	49.5
50sec-45sec	52	47	49.5
45sec-55sec	47	57	52
55sec-45sec	57	49	53
57sec-45sec	59	51	55
58sec-45sec	60	52	56

Based on above results, it seems that when GREENA is close to 50 and GREENB is close to 45 the delay for all of the cars is minimum.

Conclusion:

In this homework, we have tried to work with CSIM in order to implement different simulation scenarios such as a packing company, traffic light and M/M/1 single server queue.