

Task-1: Job Shop Model

Total stations: 5

Machines in stations: 3 2 4 3 1

Mean time of arrival of jobs: 0.25

Type of jobs: 3

Job probabilities: 0.3 0.5 0.2

Number of stations for each task: 4 3 5

Routing and mean service time of the jobs,

Job - 1 : 3 1 2 5

0.50 0.60 0.85 0.50

Job - 2: 4 1 3

1.10 0.80 0.75

Job - 3: 2 5 1 4 3

1.20 0.25 0.70 0.90 1.00

The average total delay in the queue for each job

Job	Average total delay in queue
1	0.658
2	0.472
3	0.786

Overall average delay: 0.591

Average number of jobs: 11.008

Average delay and number in the queues of the stations

Work station	Average number in queue	Average delay in queue
1	0.917	0.271
2	0.892	0.471
3	0.129	0.04
4	1.122	0.433
5	0.282	0.2

We can see that the bottleneck is station 2. The average delay is larger than the others.

Task-2: Cafeteria Simulation

1. Base case

Average and maximum delays in the queue.

	Avg (in minutes)	Max (in minutes)
Hot food	33.134	63.897
Specialty sandwich	7.777	18.211
Cashier	0.001	0.116

Time average and the maximum length of the queues.

	Avg	Max
Hot food	102.583	218
Specialty sandwich	4.556	12
Cashier	0.001	1

Average and maximum delays for each type of customers

	Avg (in minutes)	Max (in minutes)
Hot food	7.376	63.897
Specialty sandwich	6.08	18.211
Drinks	0.007	0.116

Overall delay: 6.813

Maximum number of customers at any time instant: 233

Average customer: 109.997

Total served: 121

2. 5 employees

- 1, 1, 3

Overall delay: 6.813 minutes

Total served: 121

- 2, 1, 2

Overall delay: 2.582 minutes

Total served: 289

- 1, 2, 2

Overall delay: 7.9 minutes

Total served: 123

3. 6 employees

- 2, 2, 2

Overall delay: 6.578minutes

Total served: 328

- 2, 1, 3

Overall delay: 2.445 minutes

Total served: 302

- 1, 2, 3
Overall delay: 7.896 minutes
Total served: 123

4. 7 employees

- 2, 2, 3
Overall delay: 3.779 minutes
Total served: 328

Maximum served in the combination [2, 2, 2] and [2, 2, 3]: 328 customers.
The lowest average delay in the combination [2, 1, 3]: 2.445 minutes