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	29.622	63.595
Specialty sandwich	12.333	20.218
Cashier	0.002	0.109

   Time average and the maximum length of the queues.

	Avg	Max
Hot food	92.597	196
Specialty sandwich	6.325	11
Cashier	0.001	1

Average and maximum delays for each type of customers

	Avg (in minutes)	Max (in minutes)
Hot food	6.764	63.595
Specialty sandwich	9.674	20.218
Drinks	0.01	0.109

Overall delay: 6.863
Maximum number of customers at any time instant: 209
Average customer: 101.599
Total served: 116

2. 5 employees
    - 1, 1, 3
      Overall delay: 6.862 minutes
      Total served: 116

    - 2, 1, 2
      Overall delay: 7.678 minutes
      Total served: 180

    - 1, 2, 2
      Overall delay: 6.733 minutes
      Total served: 125

3. 6 employees
    - 2, 2, 2
      Overall delay: 7.422 minutes
      Total served: 184

    - 2, 1, 3
      Overall delay: 7.677 minutes
      Total served: 180

- 1, 2, 3
  Overall delay: 6.7 minutes
  Total served: 125

4. 7 employees
   - 2, 2, 3
     Overall delay: 7.4 minutes
     Total served: 184

Maximum served in the combination [2, 2, 2] and [2, 2, 3]: 184 customers.
The lowest average delay in the combination [1, 2, 3]: 6.7 minutes
Recommended: [2, 2, 3] => though takes one minute extra, serves a lot of customers.