Task 1: Job Shop model

Job Type	Expected Average Delay in Queue
1	0.7964181161181522
2	0.6200035930903824
3	0.9280033679362726

Expected overall job delay: 0.7345279049678911

Workstation Number	Expected Average Number in Queue
1	1.04569315019252242
2	1.1288297344739613
3	0.11564504963763265
4	1.408047986733641
5	0.2547945807525899

Average Number of Jobs in the whole system: 11.972338419711637

Workstation Number	Expected Average Delay in Queue
1	0.2785923277998431
2	0.5335024413816443
3	0.03582729313810376
4	0.43588476747825494
5	0.17146822664781694

Decision Problem: As per the question, 50% of the jobs will be of type 2. Job 2 starts with the first task being done at station 4. Station 4 has the largest number in the queue. Also, station 4 incurs the second-largest delay. Both job2 and job3 have station 4 in their route. Job3 is most

delayed in all types of jobs. Hence, station 4 can be deemed bottleneck. We can add another machine to station 4.

Task 2: Cafeteria

Base Model [1,1,2]

Queue Type	Average Delay	Maximum Delay
Hot Food	39.165001739138674	79.9629222943946
Specialty Sandwiches	29.666724142588652	60.72947070349667
Cashiers	0.010868851948178954	0.5056940873816946

Queue Type	Time Average Number in Queue	Maximum Number in Queue
Hot Food	274.16963026570335	545.0
Specialty Sandwiches	42.90817636716839	87.0
Cashiers	0.3260655584453686	1.0

Customer Type	Average Delay	Maximum Delay
Hot Food, Drinks, Cashier	4.000379090323885	79.9629222943946
Specialty Sandwiches, Drinks, Cashier	9.663946032959162	60.72947070349667
Drinks, Cashier	0.024457047115998318	0.5056940873816946

Overall average total delay for types of customers: 4.651118029558782
Time average total number of customers: 319.68539000868446
Maximum total number of customers: 634
Total Served: 135

[1,1,3]

Overall average total delay for types of customers: 4.649143288525066

Time average total number of customers: 319.66895939188925

Maximum total number of customers: 634

Total Served: 135

[2,1,2]

Overall average total delay for types of customers: 5.662638400874886

Time average total number of customers: 406.4223294680027

Maximum total number of customers: 851

Total Served: 224

[1,2,2]

Overall average total delay for types of customers: 4.32802756854896

Time average total number of customers: 371.642912339349

Maximum total number of customers: 767

Total Served: 188

[2,2,2]

Overall average total delay for types of customers: 5.438374432533285

Time average total number of customers: 481.36079709943226

Maximum total number of customers: 972

Total Served: 266

[2,1,3]

Overall average total delay for types of customers: 5.661404327019963

Time average total number of customers: 406.4079650237927

Maximum total number of customers: 851

Total Served: 224

[1,2,3]

Overall average total delay for types of customers: 4.325693636540228

Time average total number of customers: 371.6229514319613

Maximum total number of customers: 767

Total Served: 188

[2,2,3]

Overall average total delay for types of customers: 5.43660261860227
Time average total number of customers: 481.338355184215
Maximum total number of customers: 972
Total Served: 266

Recommendation: If minimizing the total delay is a priority, then the configuration [1,2,3] should be selected. If maximizing the number of total-served customers is a priority, then either of the configurations [2,2,3] or [2,2,2] can be chosen.