

Examples Chapter 8

8.3. Find a feasible schedule for the following job shop data:

Job	Processing time			Route		
	Operation			Operation		
	1	2	3	1	2	3
1	5	10	12	A	B	C
2	4	3	8	A	C	B
3	9	6	7	C	B	A
4	7	5	11	B	C	A

Using a due-date of 27 for all jobs, determine

- Makespan
- Total flowtime
- Total tardiness
- Total lateness
- Number of tardy jobs

8.4. Schedule the following jobs on one machine to minimize flowtime. Give the value of optimal flowtime.

Job j	1	2	3	4	5
p_j	3	6	1	2	4

- 8.5. A small auto-repair shop has six cars in for repair. The cars' owners are in the waiting area and will leave when their cars are finished. Only Gerry is available to do the repairs. He estimates the times needed to repair the cars are 115, 145, 40, 25, 70, and 30 minutes for cars 1 to 6, respectively. What schedule would you recommend?
- 8.6. Find the schedule that minimizes weighted flowtime for the following single-machine problem:

Job i	1	2	3	4	5	6	7	8	9	10
p_i	23	25	5	15	23	6	14	6	7	12
w_i	3	1	1	3	2	1	1	1	3	3

8.14. Seven jobs (see table; data are expressed in terms of days) are to be done by a small food-processing company. Management would like to deliver orders as quickly as possible to reduce space used for in-process jobs, but wants no job to be later than three days. What schedule do you recommend?

Job j	1	2	3	4	5	6	7
p_j	4	2	8	9	3	6	1
d_j	6	13	14	22	31	33	38

8.16. Find a good flowtime schedule for the following jobs with release times:

Job i	1	2	3	4	5	6	7	8	9	10
p_i	16	11	6	18	2	20	19	20	8	16
r_i	22	6	0	6	21	7	29	121	64	48

8.18. Find the tardiness of the EDD schedule and the R&M heuristic schedule for the following jobs:

Job i	1	2	3	4	5	6	7	8	9	10
p_i	7	12	2	6	11	15	9	3	9	14
d_i	67	75	37	59	67	88	61	48	79	57

8.30. Consider the following job set:

Job i	1	2	3	4	5	6	7	8	9	10
p_i	5	11	18	8	20	4	14	9	10	16

- Find the minimum sum of earliness and tardiness if the common due-date is 90.
- Repeat if the due-date is ~~65~~ 56.

8.32. Consider the following sequence-dependent processing times:

Job	1	2	3	4	5
1	—	22	15	24	15
2	35	—	24	29	1
3	19	23	—	30	13
4	39	18	0	—	9
5	11	0	2	12	—

- Give the sequence for the shortest set-up time heuristic.
- Give the sequence for the regret heuristic.
- Give the optimal sequence.

8.36. Consider the following tardiness problem data:

Job i	1	2	3	4	5	6	7	8	9	10
p_i	5	9	11	7	1	10	7	7	15	10
d_i	57	57	36	43	32	54	54	49	40	50

- (a) Apply neighborhood search with adjacent pairwise interchange.
 (b) Compare the result to using pairwise interchange.

8.43. Determine the minimum flowtime schedule for the jobs described in the accompanying table, processed on three identical machines. How does flowtime compare to a single-machine solution?

Job i	1	2	3	4	5	6	7	8	9	10
p_i	16	9	10	8	5	11	15	6	3	19
Job i	11	12	13	14	15	16	17	18	19	20
p_i	8	4	3	11	5	1	11	10	6	5

8.44. Gerry, the mechanic in Problem 8.5, can hire another mechanic to help repair the six cars. The mechanic costs \$10 an hour and must work a minimum of four hours. What cost per hour would Gerry have to assign to customer waiting time in order to justify hiring the mechanic?

8.49. Consider the schedule 3-2-1-4 with makespan 24 for the following three-machine flow-shop problem:

Machine	Jobs			
	1	2	3	4
A	3	2	1	8
B	5	1	8	7
C	7	4	2	2

- (a) Draw the Gantt Chart for the problem.
 (b) Show that the schedule is optimal.

8.51. Consider the following three-machine flow-shop data:

Job i	1	2	3	4	5	6
p_{i1}	2	23	25	5	15	10
p_{i2}	29	3	20	7	11	2
p_{i3}	19	8	11	14	7	4

- (a) Apply the CDS heuristic and draw the Gantt Chart for the resulting schedule.
 (b) Apply Gupta's heuristic and draw the Gantt Chart for the resulting schedule.

8.56. Determine the optimal makespan schedule for the following two-machine job-shop problem.

Job <i>i</i>	1	2	3	4	5	6	7	8	9
a_i	10	2	4	8	5	12	7	—	14
b_i	2	4	5	8	6	9	—	15	—
First machine	A	A	B	A	B	B	A	B	A

8.57. Give the schedule you would recommend to minimize makespan for the following three-machine, four-job job shop. Make as strong a comment as you can about how good the schedule might be.

Job	Processing Time			Route		
	Operation			Operation		
	1	2	3	1	2	3
1	5	10	12	A	B	C
2	4	3	8	A	C	B
3	9	6	7	C	B	A
4	7	5	11	B	C	A