Technische Universität Berlin
Institut für Mathematik

Mathematical Tools for Engineering and Management
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Exercise sheet 12

Exercise 1

The makespan of a schedule is the time at which all tasks are finished. Given that there are 3 identical machines, find a makespan-optimal schedule for the following tasks (once started, jobs might no be interrupted or moved to another machine):

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

Figure 1: Job processing times

Exercise 2

Find a makespan-optimal schedule for the following scheduling problem on two unrelated machines. The processing times of the jobs a_j and b_j on the two machines are given in the following table (once started, jobs might no be interrupted or moved to another machine):

Job	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
a_j	16	3	9	4	12	7	5	9	8	8	6	7	15	15	12
b_j	9	18	8	6	7	7	8	6	9	6	10	5	10	12	11

Figure 2: Job processing times on unrelated machines

Exercise 3

Consider the following job shop scheduling problem. The aim is to find a makespan-optimal schedule.

Jobs	Machine Sequence	Processing Times
1	1, 2, 3	$P_{11} = 9, P_{21} = 8, P_{31} = 4$
2	1, 2, 4	$P_{12} = 5, P_{22} = 6, P_{42} = 3$
3	3, 1, 2	$P_{33} = 10, P_{13} = 4, P_{23} = 9$

Figure 3: Job shop scheduling problem instance