Hodgson Algorithm

Hodgson Algorithm

Step 1: Arrange the jobs in EDD order and assume this as early job set E.

Step 2: Create an late job set L (initially it will be empty)

Step 3: If no jobs in E are late, then stop the algorithm, otherwise

Step 4: Identify the first late job in E. Let it be Job K

Step 5: Identify the longest job, among the first K jobs in the sequence. Remove this job from E and place it in L.

Step 6: Revise the completion times of the jobs remaining in E and return to step 3

Step 7: Stop

Hodgson Algorithm

SPT Sequence: 1,4,3,2,7,6,5

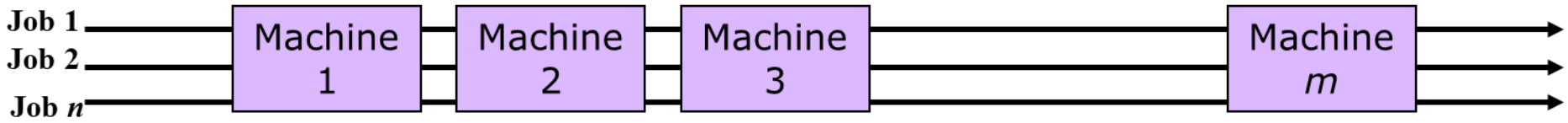
Jobs	1	2	3	4	5	6	7
Processing time	2	6	8	4	14	12	10
Due Date	6	30	19	12	24	18	12

Job	1	4	3	2	7	6	5
Processing Time	2	4	8	6	10	12	14
Completion Time	2	6	14	20	30	42	56
Due Date	6	12	19	30	12	18	24
Lateness/Tardiness	-4	-6	-5	-10	18	24	32
Tardy(1) & No Tardy (0)	0	0	0	0	1	1	1

Makespan	56
Max Tardiness	32
Number of Late Jobs	3
Total Flow Time /Sum of Completion Time	170
Total Tardiness	74

Flow Shop Scheduling

Flow Shop Scheduling – *n* jobs and *m* machines



Flow Shop Scheduling:

The order in which the machines are required to process a job is called process sequence of that job.

The process sequence of all the jobs are the same.

But the processing times of various jobs on a machine may differ.

Flow Shop – *n* jobs and *m* machines
Process Sequence will be same
Processing Time will differ

Johnsons Sequencing Rule

Consider the following two machines and six jobs flow shop scheduling problem. Using Johnson's Algorithm, obtain the optimal sequence which will minimize the makespan

	Processing Time		
Job	Machine 1	Machine 2	Due Date
1	5	4	10
2	2	3	7
3	13	14	44
4	10	1	16
5	8	9	21
6	12	11	23

Johnsons Rule

Step 1: Find the minimum processing time among the machine 1 and machine 2

Step 2: If the minimum process time requires machine 1, place the associated job in the first available position in sequence.

Step 3: If the minimum process time requires machine 2, place the associated job in the last available position in sequence.

Step 4: Remove the assigned job from consideration and return to step 1 until all positions in sequence are filled.

Johnsons Rule Sequence

	Processing Time	
Job	Machine 1	Machine 2
1	5	4
2	2	3
3	13	14
4	10	1
5	8	9
6	12	11

Sequence = 2-5-3-6-1-4

The objective function of Job Shop Problem is to minimize the Makespan and Idle Time of the Machine

Johnsons Rule Sequence Result

	Processing Tme				
	Machine 1		Machine 2		Idle Time of Machine 2
Job	Time-In	Time-Out	Time-In	Time-Out	
2	0	2	2	5	2
5	2	10	10	19	5
3	10	23	23	37	4
6	23	35	37	48	0
1	35	40	48	52	0
4	40	50	52	53	0

Makespan	53
Total Idle time	11

Consider the following 3 machines and 5 jobs flow shop problem. Solve using Johnsons Sequence

	Processing Time			
Job	Machine 1	Machine 2	Machine 3	**Due Date**
1	8	5	4	21
2	10	6	9	30
3	6	2	8	16
4	7	3	6	32
5	11	4	5	24

	Processing Time		
Job	Machine 1	Machine 2	Machine 3
1	8	5	4
2	10	6	9
3	6	2	8
4	7	3	6
5	11	4	5

Rule 1	Machine 1 minimum processing time >= Machine 2 maximum processing time
	Machine 1 minimum processing time = 6
	Machine 2 maximum processing time = 6
	OR
Rule 2	Machine 3 minimum processing time >= Machine 2 maximum processing time
	Machine 3 minimum processing time = 4
	Machine 2 maximum processing time = 6
If any one condition is applicable you can processed with Johnsons rule	

Rule 1 is satisfies and Rule 2 is not satisfied

So we can use Johnson's sequencing rule for this problem

	Processing Time		
Job	Machine 1	Machine 2	Machine 3
1	8	5	4
2	10	6	9
3	6	2	8
4	7	3	6
5	11	4	5

Conversion	Processing Time	
Job	Machine A	Machine B
1	13	9
2	16	15
3	8	10
4	10	9
5	15	9

Johnsons Sequence 3-2-5-1-4

	Processing Tme							
	Machine 1		Machine 2		Machine 3		Idel Time Machine 2	Idel Time Machine 3
Job	Time-In	Time-Out	Time-In	Time-Out	Time-In	Time-Out		
3	0	6	6	8	8	16	6	8
2	6	16	16	22	22	31	8	6
5	16	27	27	31	31	36	5	0
1	27	35	35	40	40	44	4	4
4	35	42	42	45	45	51	2	1

Makespan	51
Idle Time Machine 2	25
Idle Time Machine 3	19
Total Idle Time	44