Assignment-4

1. Explain the sequencing problem?

A) Suppose there are n jobs each of which has to be process one at a time at each of m machine A, B, C... the order of processing each job through machine is given

The time that each job require on each machine is known. the problem is to find a sequence among $(n!)^m$ no of all possible sequence for processing the jobs so that the total elapsed time [time required for completion of all the job] for all the jobs will be minimum.

2. Explain processing of n jobs through two machine algorithm.

A) Suppose there are n jobs through each of which are to be processed through two machines A & B in the order AB. Each job has to pass through the same sequence of operations in the same order.

A Job is assigned on machine A first and after, it has been completely processed on machine A, it is assigned to machine B.

If machine B is not free at the moment then the job has to wait in a waiting line for its turn on machine B.

Since passing is not allowed, therefore machine A will remain busy in processing all 'n' jobs one by one, while machine B may remain idle time of the second machines. This can be achieved only by deter-mining sequence of n jobs, which are to be processed on two sequence A & B. The procedure suggested by Jhonson for determining the optimal sequence can be

Summarized as follows

3. Explain processing of n jobs through three machine algorithm

A) It is an extension of n jobs of Jhonson procedure to the case in which there are three machines, instead of two machines. Each job is to be processed through three machines A, B and C in the order ABC

The list of jobs with their processing times

Processing time on machine	Sub number			
	1	2	3 - - - - - -	n
A	t_{11}	t_{12}	t_{13} - - - - -	t_{1n}
B	t_{21}	t_{22}	t_{23} - - - - -	t_{2n}
C	t_{31}	t_{32}	t_{33} - - - - -	t_{3n}

An optimal solution to the above problem can be obtained if either or both of following condition holds good.

1. The minimum processing time on machine A is atleast as great as the max processing time on machine B, that is $\min t_{1j} \geq \max t_{2j}$ for $j=1,2,\dots n$
2. The minimum processing time on machine C is atleast as great as the maximum processing time on machine B, that is $\min t_{3j} \geq \max t_{2j}$, for $j=1,2,\dots n$.

If either or both the above conditions hold good, then the problem of processing of n jobs through 3 machines can be converted in to a 2 machine problem By introducing dummy machines say G and H $\ni$ G= A+B and H=B+C and apply Jhonson technique to get the optimal sequence.

After getting optimal sequence go to the original processing times of n jobs through 3 machines to determine the total elapsed time and which is explained below through an example

4. Suppose we have five jobs, each of which has to be processed on two machines A & B in the order AB processing times are given in the following table.

Job	machine (A)	machine (B)
1	6	3
2	2	7
3	10	8
4	4	9
5	11	5

Determine an order in which these jobs should be processed so as to minimize the total processing time.

A)

Job	machine(A)	machine(B)
1	6	3
2	2	7
3	10	8
4	4	9
5	11	5

2				

Job	machine(A)	machine(B)
1	6	3
3	10	8
4	4	9
5	11	5

2				1

Job	machine(A)	machine(B)
3	10	8
4	4	9
5	11	5

2	4			1

Job	machine(A)	machine(B)
3	10	8
5	11	5

2	4		5	1

Job	machine(A)	machine(B)
3	10	8

2	4	3	5	1

Job	machine(A)		machine(B)		Idle time	
	Time in	Time out	Time in	Time out	A	B
2	0	0+2=2	2	2+7=9	0	2
4	2	2+4=6	9	9+9=18	0	0
3	6	6+10=16	18	18+18=26	0	0
5	16	16+11=27	27	27+5=32	0	1
1	27	17+6=33	33	33+3=36	[illegible]	1
	[illegible]		36		3	0
	36				3	4

Idle time for machine(A) = Total elapsed time − time when the last job is out of machine (A)

= 36 − 33 = 3

∴ machine(A) = 3 hours

Idle time for machine (B) = 2+(9−9)+(13−13)+(27−26)+(13−32)+(36−36)

= 2+0+0+1+1+0 = 4

∴ machine (B) = 4 hrs