Operation Research
(Mini Project)

Roll No:- 536

Q.) There are nine jobs, each of which must go through two machines P and Q in the order PQ, the processing times (in hours) are given below.

Machine	Jobs								
	A	B	C	D	E	F	G	H	I
P	2	5	4	9	6	8	7	5	4
Q	6	8	7	4	3	9	3	8	11

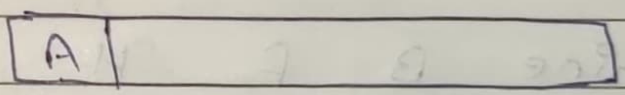
Find the sequence that minimizes the total elapsed time T. Also calculate the total idle time for the machines in this period.

Solution:

The minimum processing time on two machines is 2 which corresponds to task A on machine P. This shows that task A will be preceding first. After assigning task A, we are left with 8 tasks on two machines.

Machine	B	C	D	E	F	G	H	I
P	5	4	9	6	8	7	5	4
Q	8	7	4	3	9	3	8	11

Minimum processing time in this reduced problem is 3 which correspond to jobs E and G (both on machine Q) Now since the corresponding processing time of task E on machine P is less than the corresponding processing time of task G on machine Q therefore task E will be processed in the last and task G next to last. The situation will be dealt as



The problem now reduces to following 6 tasks on two machines with processing time as follows.

Machine	B	C	D	F	H	I
P	5	4	9	8	5	4
Q	8	7	4	9	8	11

Here since the minimum processing time is 4 which occurs for tasks C and I on machine P and task D on machine Q. Therefore, the task C which has less processing time on P will be processed first and then task I and task D will be placed at the last i.e; 7th sequence cell

The sequence will appear as follows:

A	C	I				D	E	G

The problem now reduces to the following 3 tasks on two machines

Machine	B	F	H
P	5	8	5
Q	8	9	8

The optimal sequences are represented as

A	I	C	B	H	F	D	E	G

Job Sequence	Machine A Time In	Out	Machine B In	Out
A	0	2	2	8
I	2	6	8	19
C	6	10	19	26
B	10	15	26	34
H	15	20	34	42
F	20	28	42	51
D	28	37	51	55
E	37	43	55	58
G	43	50	58	61

The total elapsed time for proposed starting from job A to completion of job G is 61 hours.
During this time machine P remains idle for 11 hours (from 50 hours to 61 hours) and the machine Q remains idle for 2 hours only (from 0 hours to 2 hour)