

Question 1. (15 marks)

We wish to calculate some performance metrics for a scheduler and a set of tasks.

In the following tables, times are all in milliseconds.

Assume tasks do not stall for I/O. Ignore scheduler delays. Tasks run once.

Deadline is the absolute time of the deadline (i.e., it is NOT relative to start time).

Note that in the following examples, the first 4 columns are the same for all the tables.

Here is an example table completed for a "First In First Out" scheduler.

Task Number	Arrival Time	Execution Time	Deadline	Completion Time	Turnaround Time	Waiting Time	Deadline Miss?
1	0	20	33	20	20	0	no
2	1	5	6	25	24	19	yes
3	2	2	8	27	25	23	yes
4	3	4	29	31	28	24	yes
5	4	3	35	34	30	27	no

Average Waiting Time	18.6	ms
Average Turnaround Time	25.4	ms
Throughput (Jobs/second)	147	jobs/s

(a) Complete the following table for a Shortest Job First scheduler (5 marks)

Task Number	Arrival Time	Execution Time	Deadline	Completion Time	Turnaround Time	Waiting Time	Deadline Miss?
1	0	20	33	34	34	14	Y
2	1	5	6	15	14	9	Y
3	2	2	8	4	2	0	N
4	3	4	29	11	8	4	N
5	4	3	35	7	3	0	N

Assuming
Scheduler is
pre-emptive.

Average Waiting Time	5.4	ms
Average Turnaround Time	12.2	ms
Throughput (Jobs/second)	147	jobs/s

(b) Complete the following table for a Round Robin scheduler with a quantum of 1 millisecond. (5 marks)

Task Number	Arrival Time	Execution Time	Deadline	Completion Time	Turnaround Time	Waiting Time	Deadline Miss?
1	0	20	33	34	34	14	Y
2	1	5	6	19	18	13	Y
3	2	2	8	8	6	4	N
4	3	4	29	17	14	10	N
5	4	3	35	14	10	7	N

Average Waiting Time	9.6 ms
Average Turnaround Time	16.4 ms
Throughput (Jobs/second)	147 jobs/s

(c) Complete the following table for an Earliest Deadline First scheduler. (5 marks)

Task Number	Arrival Time	Execution Time	Deadline	Completion Time	Turnaround Time	Waiting Time	Deadline Miss?
1	0	20	33	31	31	11	N
2	1	5	6	6	5	0	N
3	2	2	8	8	6	4	N
4	3	4	29	12	9	5	N
5	4	3	35	34	30	27	N

Average Waiting Time	9.4 ms
Average Turnaround Time	16.2 ms
Throughput (Jobs/second)	147 jobs/s