

CSC 112: Computer Operating Systems

Lecture 5

Scheduling Exercises Solution

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Scheduling

- Here is a table of processes and their arrival and execution times.
- 1) Fill in the scheduling table with the Process ID (PID) that runs at each time instant, under 4 policies: First Come First Serve (FCFS), Shortest Job First (SJF), Shortest-Remaining-Time-First (SRTF), Round-Robin (RR) with timeslice quantum = 1. Assume that context switch overhead is 0. For RR, assume that an arriving process is scheduled to run at the beginning of its arrival time, i.e., it is added to the head of the queue upon arrival.
- 2) Compute the finish times and response times for all 5 processes, and the average response time. (If the division is hard, write a fraction like $28/5$ instead of 5.6)

Scheduling I

| P I D | Arriv. time | Exec Time | FCFS Finish Time | FCFS Response Time | SJF Finish Time | SJF Response Time | SRTF Finish Time | SRTF Response Time | RR Finish Time | RR Response Time |
|-------------|----------------|--------------|------------------------|--------------------------|-----------------------|-------------------------|------------------------|--------------------------|----------------------|------------------------|
| 1 | 0 | 2 | | | | | | | | |
| 2 | 1 | 6 | | | | | | | | |
| 3 | 4 | 2 | | | | | | | | |
| | | | | Avg RT | | Avg RT | | Avg RT | | Avg RT |

| | | | | | | | | | | | |
|------|---|---|---|---|---|---|---|---|---|---|----|
| FCFS | | | | | | | | | | | |
| SJF | | | | | | | | | | | |
| SRTF | | | | | | | | | | | |
| RR | | | | | | | | | | | |
| Time | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Gantt Chart

Scheduling I ANS

| P I D | Arriv. time | Exec Time | FCFS Finish Time | FCFS Response Time | SJF Finish Time | SJF Response Time | SRTF Finish Time | SRTF Response Time | RR Finish Time | RR Response Time |
|-------------|----------------|--------------|------------------------|--------------------------|-----------------------|-------------------------|------------------------|--------------------------|----------------------|------------------------|
| 1 | 0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 |
| 2 | 1 | 6 | 8 | 7 | 8 | 7 | 10 | 9 | 10 | 9 |
| 3 | 4 | 2 | 10 | 6 | 10 | 6 | 6 | 2 | 7 | 3 |
| | | | | Avg RT 5.6 | | Avg RT 5.6 | | Avg RT 4.3 | | Avg RT 5 |

| | | | | | | | | | | |
|------|---|---|---|---|---|---|---|---|---|---|
| FCFS | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 |
| SJF | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 |
| SRTF | 1 | 1 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 2 |
| RR | 1 | 2 | 1 | 2 | 3 | 2 | 3 | 2 | 2 | 2 |

Time 0 1 2 3 4 5 6 7 8 9 10

Gantt Chart

Scheduling II

| P I D | Arriv. time | Exec Time | FCFS Finish Time | FCFS Response Time | SJF Finish Time | SJF Response Time | SRTF Finish Time | SRTF Response Time | RR Finish Time | RR Response Time |
|-------------|----------------|--------------|------------------------|--------------------------|-----------------------|-------------------------|------------------------|--------------------------|----------------------|------------------------|
| 1 | 0 | 3 | | | | | | | | |
| 2 | 1 | 5 | | | | | | | | |
| 3 | 3 | 2 | | | | | | | | |
| 4 | 9 | 2 | | | | | | | | |
| | | | | Avg RT | | Avg RT | | Avg RT | | Avg RT |

| | | | | | | | | | | | | | |
|------|---|---|---|---|---|---|---|---|---|---|----|----|----|
| FCFS | | | | | | | | | | | | | |
| SJF | | | | | | | | | | | | | |
| SRTF | | | | | | | | | | | | | |
| RR | | | | | | | | | | | | | |
| Time | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |

Gantt Chart

Scheduling II ANS

| P I D | Arriv. time | Exec Time | FCFS Finish Time | FCFS Response Time | SJF Finish Time | SJF Response Time | SRTF Finish Time | SRTF Response Time | RR Finish Time | RR Response Time |
|-------------|----------------|--------------|------------------------|--------------------------|-----------------------|-------------------------|------------------------|--------------------------|----------------------|------------------------|
| 1 | 0 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 6 | 6 |
| 2 | 1 | 5 | 8 | 7 | 8 | 7 | 10 | 9 | 11 | 10 |
| 3 | 3 | 2 | 10 | 7 | 10 | 7 | 5 | 2 | 7 | 4 |
| 4 | 9 | 2 | 12 | 3 | 12 | 3 | 12 | 3 | 12 | 3 |
| | | | | Avg RT 5 | | Avg RT 5 | | Avg RT 4.25 | | Avg RT 5.75 |

| | | | | | | | | | | | | | |
|------|---|---|---|---|---|---|---|---|---|---|----|----|----|
| FCFS | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | |
| SJF | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | |
| SRTF | 1 | 1 | 1 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 4 | 4 | |
| RR | 1 | 2 | 1 | 3 | 2 | 1 | 3 | 2 | 2 | 4 | 2 | 4 | |
| Time | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |

Gantt Chart