

CHAPTER 3: SCHEDULING

ANSWERS

1. Answer the following questions, using the process scheduling table below:

Process Name	Arrival Time	Processing Time
A	4	5
B	7	4
C	1	5
D	0	2
E	3	3

Shows the execution pattern for one cycle and find out turnaround time and waiting time for each process, using the following scheduling policies:

Round Robin (quantum time (q) = 3)

Non-preemptive SJF (Shortest Job First) / Shortest Process Next (SPN)

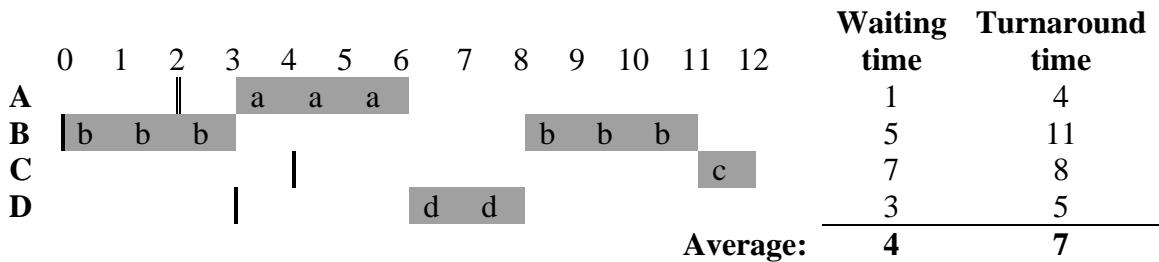
Preemptive SJF (Shortest Job First) / Shortest Remaining Time (SRT)

2. Answer the following question using the process scheduling table below.

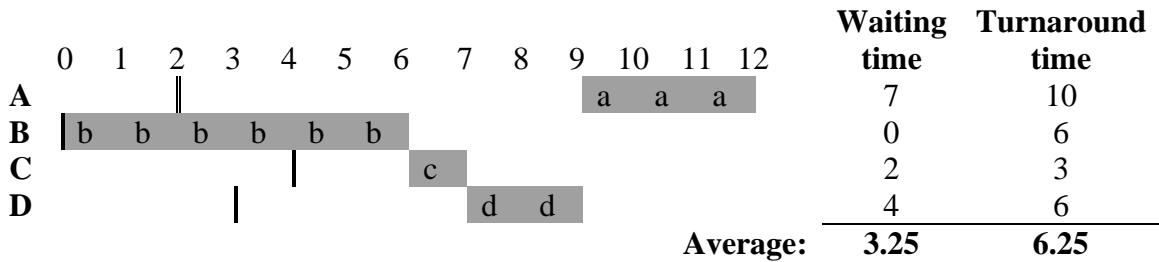
Process Name	Arrival Time	Processing Time
A	2	3
B	0	6
C	4	1
D	3	2

Show the sequence of process execution for one cycle and find out the turnaround time and the average waiting time for each process, using the following scheduling policies:

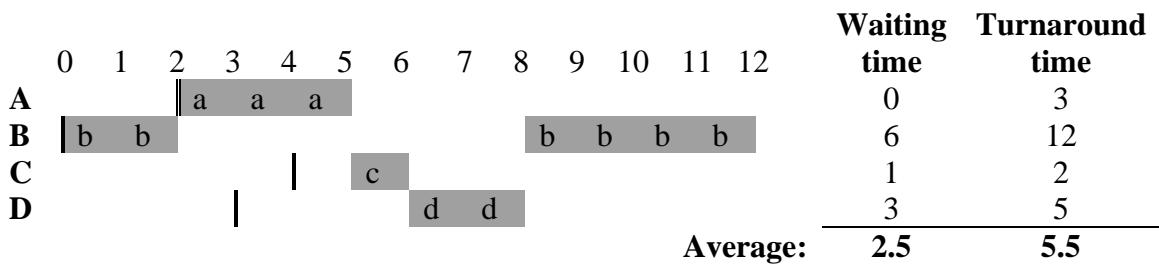
i. Round Robin (quantum time (q) = 3)



ii. Shortest Process Next (SPN) / Non-preemptive SJF (Shortest Job First)



iii. Shortest Remaining Time (SRT) / Preemptive SJF (Shortest Job First)



3. Consider the following set of processes, with the length of CPU burst given in milliseconds:

Teliti set proses-proses berikut, dengan panjang masa letusan-CPU diberi dalam milisaat.

Process Proses	Burst time Masa Letusan	Priority Keutamaan
P1	10	3
P2	1	1
P3	2	5
P4	1	4
P5	5	2

The processes are assumed to have arrived in the order P1, P2, P3, P4 and P5, all at time 0.
Proses-proses tersebut dianggap tiba dalam turutan P1, P2, P3, P4 dan P5, semua pada masa 0.

- Draw four Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: FCFS, SJF, non-preemptive priority (a smaller number implies a higher priority), and RR (quantum = 1).
Lukiskan Carta Gantti yang menunjukkan perlaksanaan proses-proses ini menggunakan penskedulan FCFS, SJF, keutamaan bukan-pintasan (nomor keutamaan kecil mewakili keutamaan yang lebih tinggi), dan RR (kuantum = 1).
- What is the turnaround time of each process for each of the scheduling algorithms (in question 1)?
Berapakah masa pusing-balik bagi setiap proses bagi setiap algoritma penskedulan (dalam soalan 1) yang digunakan?
- What is the waiting time of each process for each of the scheduling algorithms (in question 1)?
Berapakah masa menunggu bagi setiap proses bagi setiap algoritma penskedulan (dalam soalan 1) yang digunakan?
- Which of the algorithms in question 1 results in the minimum average waiting time (over all processes)?
Penskedulan manakah (dalam soalan 1) yang menghasilkan purata masa menunggu yang paling pendek?

Answers:

Process	Burst time	Priority
P1	10	3
P2	1	1
P3	2	5
P4	1	4
P5	5	2

First-Come-First-Served (FCFS)

SJF (Shortest Job First)

Non-preemptive Priority

Round Robin (quantum time (q) = 1)

4. Give and explain two categories of decision mode in scheduling policies. Give an example of scheduling technique for each category.

Beri dan terangkan dua kategori mod keputusan di dalam polisi pengskedulan.

Berikan satu contoh teknik pengskedulan bagi setiap kategori.

Nonpreemptive -Once a process is in the running state, it will continue until it terminates or blocks itself for I/O.

e.g. First Come First Serve, Shortest Process Next

Preemptive -Currently running process may be interrupted and moved to the Ready state by the operating system, one process cannot monopolize the processor for very long.

e.g. Round Robin, Shortest Remaining Time

5. What is turnaround time?

Apakah itu masa pusing balik?

Total time process spend in the system

6. Why do we care if a process scheduler is fair?

An unfair scheduler is giving preference to certain jobs over others. The risk is that the less preferred jobs might never get to run. This was mentioned in the chapter as starvation.

7. The SJF process scheduling algorithm is optimum, so why do we not use it as it was described initially?

As initially described it would require that we knew in advance the next CPU burst of each process, and we can't know this, of course. Later we described a method by which we could estimate the next CPU burst and we used that instead.

8. Since FCFS process scheduling is so fair, what is the problem with it?

It is subject to the "convoy effect" in which a short process that arrives just after a long process will receive a very long waiting time, thus increasing our average wait time. We kept looking for process

scheduling algorithms that gave us a shorter average wait time.

9. Give and explain four (4) situations when the CPU scheduling decisions may take place.

CPU scheduling decisions may take place when a process:

1. Switches from running to blocking state
2. Switches from running to ready state
3. Switches from blocking to ready
4. Terminates

10. Explain the five (5) scheduling criteria, and how they can be optimized.

- **CPU utilization** - maximize/keep the CPU as busy as possible
- **Throughput** - maximize the number of processes that complete their execution per time unit
- **Turnaround time** - minimize the amount of time to execute a particular process
- **Waiting time** - minimize the amount of time a process has been waiting in the ready queue
- **Response time** - minimize the amount of time it takes from when a request was submitted until the first response is produced, **not** output (for time-sharing environment)

11. What is dispatch latency?

Dispatch latency is the time it takes for the dispatcher to stop one process and start another running.