



Assignment 01

Date: 31-July-2021
Date: 14-Aug-2021**Title:** Scheduling Algorithms.**Problem Statement:**

Write a program to simulate CPU scheduling algorithms: FCFS, SJF (Preemptive), Priority (Non-preemptive) & Round Robin (Preemptive).

S/w & H/w Requirement**Hardware:**

Manufacturer: Acer Inc.

Processor: Intel Core i5-8265U @ 1.60GHz

RAM: 8 GB, ROM: 512 GB SSD

Software:

Operating System: Windows-10 (64-bit)

IDE: Eclipse 2020

Compiler: GCC version 6.3.0

Theory:

CPU scheduling: It is a process of determining which process will own CPU for execution while another process is on hold.

- ① The main task of CPU scheduling is to make sure that whatever the CPU remains idle, the OS at least select one of the processes available in the ready queue for execution.
- ② The selection of process carried out by CPU scheduler. If selects one of the processes in memory that are ready for execution.



PICT, PUNE

Preemptive CPU scheduling:

- In this, tasks are mostly assigned with their priorities.
- Sometimes it is important to run a task with a higher priority before another lower priority task, even if the lower priority task is still running.
- The lower priority task holds for some time & resumes when higher priority task finishes its execution.

Non-preemptive CPU scheduling:

- In this, CPU has been allocated to a specific process.
- The process that keeps CPU busy will release the CPU either by switching context or terminating.

Important Terminologies:

① Burst time / Execution time:

It is time required by process to complete execution.

② Arrival Time:

Time when process enters ready state.

③ Finish Time:

When process complete & exit from a system.

④ Jobs:

Type of program without any kind of user interaction.

⑤ Waiting Time:

If is time that specific process needs to spend in the ready queue.



⑥ Turnaround Time:

It is amount of time to execute a specific process.

CPU scheduling Algorithms:

① first come first serve (FCFS):

- ↳ In this, the process which requests CPU, gets the CPU allocation first.
- ↳ Scheduling queue is managed on the FIFO principle.

② Short Job first (SJF)

- ↳ In this method, the processor will be allocated to the task which is closest to its completion.
- ↳ This method is mostly applied in batch environments where short jobs are required to be given preference.

③ Priority Based scheduling:

- ↳ In this method, the scheduler selects the task to work as per the priority.
- ↳ OS decides the priorities based on various factors like memory requirements, time requirements etc.

④ Round-Robin scheduling:

- ↳ In this method, time slices are assigned to each process in equal portions & in circular order.
- ↳ It is real time system which responds to the event within a specific time limit.



PICT, PUNE

Algorithm / flow chart:

① FCFS

- ▷ input processes with their burst time. (bt)
- ▷ find & arrival time, sort them according to at.
- ▷ calculate waiting time of each process as
= arrival time of process -
finish time of last process.
- ▷ calculate turnaround time as
= waiting time + burst-time
- ▷ calculate avg. waiting time
= total waiting-time / no. of processes.
- ▷ calculate avg. turnaround time
= total turnaround-time / no. of processes.

② SJF - Preemptive

- ▷ input processes with their arrival & burst times.
- ▷ select process which have shortest burst time among all process will execute first. Resolve ties on FCFS basis.
- ▷ calculate burst times & turnaround time for each process & take average of them.
- ▷ stop.

③ Priority scheduling

- ▷ input processes along with their arrival time, burst time & priority
- ▷ start execution of process with increasing order of arrival time.
- ▷ put other processes & ready queue & always

pick the process having highest priority.

v> calculate turnaround time & waiting time for each process & take average of them.

v> stop.

④ Round Robin.

v> input process with their arrival time & burst time.

v> input the time quantum k.

v> processes the jobs in order of arrival time, each job should be processed for k units of time.

v> After k units time k, allocate CPU to the next job in ready queue.

v> Calculate turnaround time & waiting time for each process & take average of them.

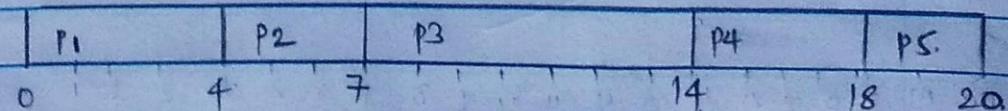
v> stop.

Test cases:

⑤ Consider following set of Jobs.

Process	Priority	Burst Time	Arrival Time.
P1	1	4	0
P2	2	3	0
P3	1	7	6
P4	3	4	11
P5	2	2	12

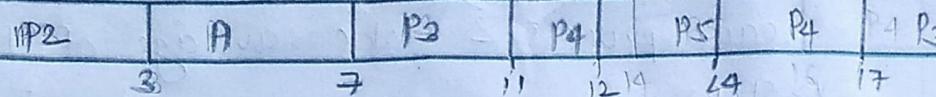
v> FCFS



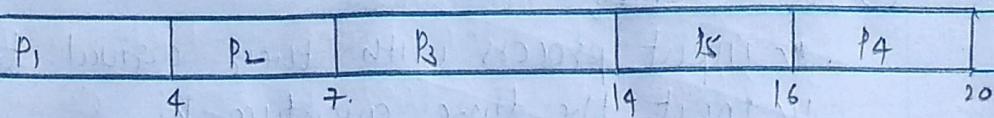


PICT, PUNE

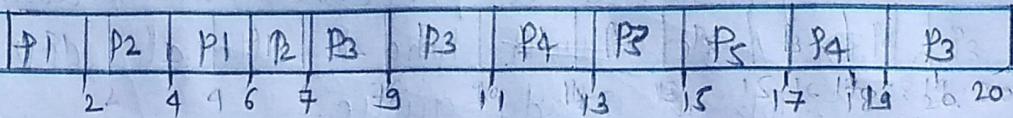
i) SJF (Preemptive)



ii) Priority scheduling.



iv) Round Robin (time quantum: 2 sec)



Comparative analysis:

Job.	FCFS		SJF		Priority	
	Turnaround Time.	wt	Turn. Time.	Waiting time.	Turn. time.	Waiting time.
P1	4	0	7	3	4	0
P2	7	4	3	0	7	4
P3	8	1	14	7	8	1
P4	7	3	6	2	9	5
P5	8	6	2	0	4	2
Average	6.8	2.8	6.4	2.4	6.4	2.4

(4)



Round Robin	
Turnaround Time.	Waiting Time.
6	2
7	4
14	7
8	4
5	3
8	4

for a given set of jobs:

Result Analysis:

for a given set of job:

SIF & Priority Algorithm takes minimum average waiting time &

SJF & Priority Algorithm is having minimum turnaround time.

Conclusion:

In this assignment, I learned concept of scheduling, related terms & four scheduling algorithms. I have simulated scheduling algorithms using C++ programming language & performed their result analysis.

```
Enter Number of Jobs: 5
Enter Arrival time and Burst time:
Job #1: 0 4
Job #2: 0 3
Job #3: 6 7
Job #4: 11 4
Job #5: 12 2
```

First Come First Serve algorithm:

Job Scheduling Details

```
(job_id, arrival_time, burst_time, turnaround_time, waiting_time)
 1  0   4   4   0
 2  0   3   7   4
 3  6   7   8   1
 4  11  4   7   3
 5  12  2   8   6
```

Average Turnaround Time: 6.8

Average Waiting Time: 2.8

Shortest Job First (Non-preemptive) algorithm:

Job Scheduling Details

```
(job_id, arrival_time, burst_time, turnaround_time, waiting_time)
 1  0   4   7   3
 2  0   3   3   0
 3  6   7   8   1
 4  11  4   9   5
 5  12  2   4   2
```

Average Turnaround Time: 6.2

Average Waiting Time: 2.2

```
Shortest Job First (Preemptive) algorithm:  
Job Scheduling Details  
(job_id, arrival_time, burst_time, turnaround_time, waiting_time)  
 1  0   4   7   3  
 2  0   3   3   0  
 3  6   7   14  7  
 4  11  4   6   2  
 5  12  2   2   0  
Average Turnaround Time: 6.4  
Average Waiting Time: 2.4
```

```
Priority Scheduling algorithm:  
Enter the priorities of the jobs:  
Job #1: 1  
Job #2: 2  
Job #3: 1  
Job #4: 3  
Job #5: 2  
Job Scheduling Details  
(job_id, arrival_time, burst_time, turnaround_time, waiting_time)  
 1  0   4   4   0  
 2  0   3   7   4  
 3  6   7   8   1  
 4  11  4   9   5  
 5  12  2   4   2  
Average Turnaround Time: 6.4  
Average Waiting Time: 2.4
```

```
Round Robin Scheduling algorithm:  
Enter time quantum: 2  
Job Scheduling Details  
(job_id, arrival_time, burst_time, turnaround_time, waiting_time)  
 1  0   4   6   2  
 2  0   3   7   4  
 3  6   7   14  7  
 4  11  4   8   4  
 5  12  2   5   3  
Average Turnaround Time: 8  
Average Waiting Time: 4
```
