

Assignment No. 04

Problem Statement: Write a program to simulate CPU Scheduling Algorithms: FCFS, SJF (Preemptive), Priority (Non-Preemptive) and Round Robin (Preemptive)

Objectives:

1. To study the process management and various scheduling policies with Preemptive and Non-preemptive.
2. To study and analyze different scheduling algorithms.

Software Requirement:

Operating System recommended :- 64-bit Open source Linux or its derivative

Programming tools recommended: - Eclipse IDE

Hardware Requirement: I3 and I5 machines

Theory:

- **Burst time(BT):**

Burst time is the amount of time required by a process for executing on CPU. It is also called as execution time or running time. Burst time of a process can not be known in advance before executing the process.

Burst Time (B.T.) = Completion Time (C.T.) - Waiting Time (W.T.)

- **Completion time (CT)** - Completion time is the point of time at which a process completes its execution on the CPU and takes exit from the system. It is also called as exit time.
- **Turn around time: (TAT)** - It is the time interval from the time of submission of a process to the time of the completion of the process. It can also be considered as the sum of the time periods spent waiting to get into memory or ready queue, execution on CPU and executing input/output.
$$TAT = WT + BT$$

Or

$$TAT = CT - AT(\text{Arrival time})$$
- **Waiting Time** - Waiting time is the total time spent by the process in the ready queue waiting for CPU.
$$WT = TAT - BT$$
- **Response time** - Time from the submission of a request until the first response is produced by CPU. CPU response time Response time is the total amount of time it takes to respond to a request for service.

Scheduling Methods:

- **Preemptive Scheduling:**

In preemptive scheduling, the CPU can be taken away from the process. A process can be temporarily suspended due to:

- Request for I/O
- Time slab is over

- **Nonpreemptive Scheduling:**

In non preemptive scheduling, a process runs to its completion. Once a process has been given the CPU, the CPU cannot be taken away from that process.

Scheduling Algorithms:

- **First Come First Serve**
- **Shortest Job First with nonpreemption**
- **Priority scheduling**
- **Round Robin**

1) **First Come First Serve:**

- First job that requests the CPU gets the CPU
- Non preemptive - Process continues till the burst cycle ends

P. No.	Arrival Time	Burst Time	Completion Time	Turn-around Time= CT-AT	Waiting Time= TAT-AT
P1	0	4	4	0	0
P2	1	3	7	6	3
P3	2	1	8	6	5
P4	3	2	10	7	5
P5	4	5	15	11	6

P1	P2	P3	P4	P5		
4	7	8	10	15		

- Average TAT = $(4+6+6+7+11)/5 = 5$
- Average WT = $(0+3+5+5+6)/5 = 3.8$

2) **Shortest Job First:**

- Schedule process with the shortest burst time
- It Minimizes average wait time and average response time
- It May starve long jobs

3) Round Robin:

- Run process for a time slice or time quantum, then move to FIFO

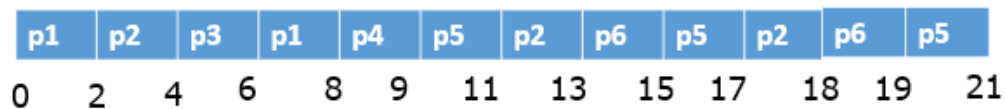
Example:- let time quantum=2

P.No.	A.T.	B.T.	C.T.	TAT =C.T.-A.T	WT=TAT-BT
P1	0	0	8	8	4
P2	1	0	18	17	12
P3	2	0	6	4	2
P4	3	0	9	6	5
P5	4	0	21	17	11
p6	6	0	19	13	10

Process queue



Gantt Chart



- **Advantages**
 - Fair (Each process gets a fair chance to run on the CPU)
 - Low average wait time, when burst times vary
 - Faster response time
- **Disadvantages**
 - Increased context switching
 - High average wait time, when burst times have equal lengths
 - If TQ(time quantum) is greater, context switching is less

4) Priority Scheduling:

- Priority based Scheduling
- Each process is assigned a priority
- Scheduling policy : pick the process in the ready queue having the highest priority
- Advantage : mechanism to provide relative importance to processes
- Disadvantage : could lead to starvation of low priority processes

Input:

1. Enter the number of processes:
2. Enter burst time and arrival time of each process

Output:

1. Compute Waiting time, turnaround time, average waiting time, average turnaround time and throughput.

For each algorithm display result as follows:

Process	Burst Time	Arrival Time	Completion Time	Waiting Time	Turnaround Time
P1					
P2					
P3					
-					

Calculate

1. Average waiting time
2. Average turnaround time

Test Cases:

1. Check arrival time of all process should not be same.

Conclusion:

Learn about Scheduling methods, different types of scheduling algorithms.

Frequently Asked Questions: (Do not write in assignment this is just for oral)

- i) What are the types of CPU scheduler?
- ii) What is the difference between long and short term scheduling?
- iii) Logic of program?
- iv) What is preemptive and non-preemptive scheduling?
- v) What are types of scheduling algorithms?
- vi) Why Priority scheduling may cause low-priority processes to starve?
- vii) What are the goals of scheduling?
- viii) Define the difference between preemptive and nonpreemptive scheduling.
- xi) Which scheduling algorithm is best? Why?