



Pune District Education Association's College Of Engineering

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Experiment no:

Aim:- Write a program to simulate CPU scheduling Algorithms : FCFS ; SJF (preemptive) , Priority (Non-preemptive) and Round Robin (Preemptive)

Objective:-

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

Problem Statement:-

Write a program to simulate CPU scheduling Algorithms FCFS, SJF, Priority and Round Robin.

Outcomes:-

Implementation of CPU scheduling Algorithms.

Software requirements:- Latest jdk, Eclipse

Hardware requirement:- MIC LENOVO Thinkcenter

M700i3, 6100, 6th Gen H81, 4GB RAM, 500MBHDD

Theory:-

1. FCFS (First come first serve)

This method of scheduling means that the first process to request the processor gets it until it

finished execution. With this algorithm, processes are assigned the CPU in the order they request it.

- FCFS is non-preemptive CPU scheduling algorithm.
It is also called first in first out method (FIFO)
- FCFS is simple to implement because it uses a FIFO queue. This algorithm is fine for most of the batch OS.

Advantage:

1. Simple to implement
2. Fair

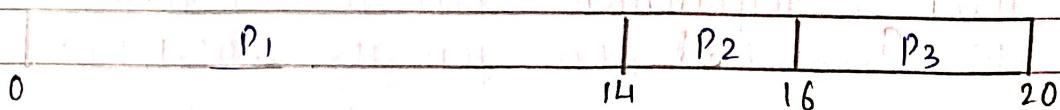
Disadvantage:

1. Waiting time depends on arrival order
2. Convoy effect: short process stuck waiting for long process

Ex:-

Process	Burst Time
P ₁	14
P ₂	12
P ₃	4

Grant chart:



Process	Waiting Time
P ₁	0
P ₂	14
P ₃	16

Process	Waiting Time
P ₁	0
P ₂	14
P ₃	16



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$$\text{Average waiting time} = \frac{0 + 14 + 16}{3} = 10$$

$$\text{Turnaround time} = \text{Waiting time} + \text{Burst time}$$

Process	Waiting time	Turnaround time
P ₁	0	14
P ₂	14	16
P ₃	16	20

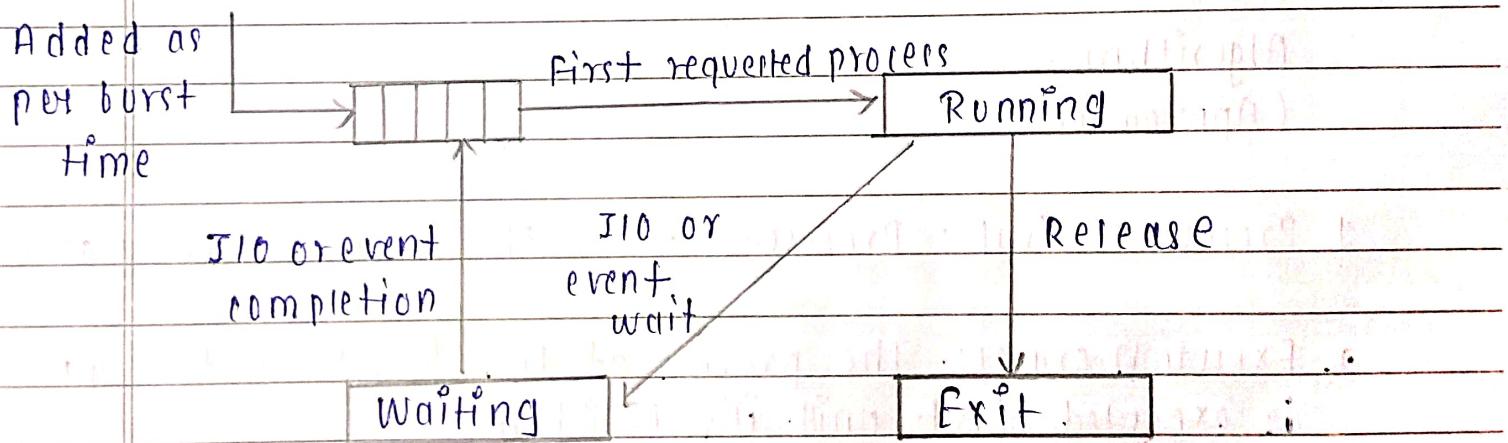
Algorithm:-

(Approach):-

1. Process Arrival : Processes enter the queue as they arrive
2. Execution order :- The process at the front of the queue is executed first until it's finished.
3. Non-preemptive :- Once a process starts, it runs to completion without being interrupted.

2. SJF (preemptive)

- It is also known as SJN scheduling algorithm.
- It handles the process based on length of their CPU cycle time. It reduce average waiting time over FIFO algorithm.
- Preemptive version of SJF is called Shortest remaining Time Next
- It will preempt the currently executing process, whereas a non-preemptive SJF algorithm will allow the currently running process to finish its CPU burst.



Advantage:

- Reduce average waiting time.

Disadvantage:

- Cause extremely long turnaround times or starvation.

Ex:

Consider processes P₁, P₂, P₃, P₄ & P₅.



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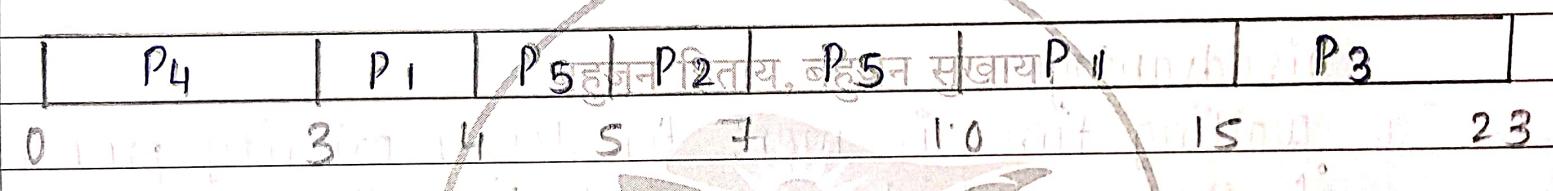
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Process	Burst time	Arrival time	Completion time
P ₁	6	2	8
P ₂	2	5	7
P ₃	8	11	19
P ₄	3	0	3
P ₅	4	4	8

Gantt chart:



As we know,

$$\text{Turnaround time} = \text{completion time} - \text{arrival time}$$

$$\text{Waiting time} = \text{Turnaround time} - \text{burst time}.$$

Process	Completion time	Turnaround time	Waiting time
P ₁	15	13	7
P ₂	7	2	0
P ₃	23	22	14
P ₄	3	3	0
P ₅	10	6	2

3. Priority Scheduling :-

Priority CPU scheduling algorithm is preemptive and non-preemptive algorithm. It is one of most common scheduling algorithm in batch system.

Priority can be assigned by a system admin using characteristics of the process.

Advantage:-

1. Easy to use
2. Processes with higher priority execute first, saving time.

Disadvantage:-

1. Waiting time is more for lower priority process even if their required CPU burst time is less.

Algorithm :-

(Approach) :-

1. First input the processes with their burst time & priority.
2. Sort the processes and burst time & then give priority accordingly.
3. Now simply apply FCFS algorithm.

Ex :-

Process	Burst time	Priority
P ₁	5	3
P ₂	2	4
P ₃	6	1
P ₄	4	2



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Grantt chart :-

	P ₃	P ₄	P ₁	P ₂	
	0	6	10	15	17

Waiting time and turnaround time :-

Process	Waiting time	Turnaround time
P ₁	10	15
P ₂	बहुजन हिताय, बहुजन सुखाय।	17
P ₃	0	6
P ₄	6	10

4. Round Robin Scheduling :-

- Round robin is a preemptive scheduling algorithm.
- It is used in interactive system.
- Here process are given a limited amount of time of processor time called a time slice or time quantum.
- If a process does not complete before its quantum expires the system then places the preempted process at the back of the ready queue.

Advantage :-

1. All the jobs get a fair allocation.
2. It deals with all process without any priority.

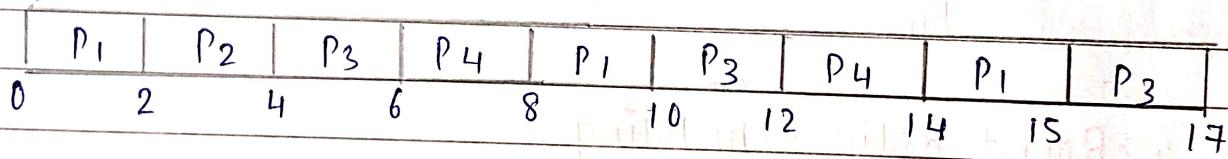
Disadvantage:

1. If the slicing time of OS is low, the processor output will be reduced.
2. This method spends more time on context switching.

Ex:-

Process	Burst time
P ₁	5
P ₂	2
P ₃	6
P ₄	4

Gantt chart:



Process	Waiting time	Turnaround time
P ₁	10	$10 + 5 = 15$
P ₂	2	$2 + 2 = 4$
P ₃	11	$11 + 6 = 17$
P ₄	10	$10 + 4 = 14$

Average waiting time = 8.25

Average turnaround time = 12.5



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Conclusion:-

CPU scheduling algorithms implemented successfully.

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