

**Assignment No. 3****Problem Definition:**

**Write a Java program (using OOP features) to implement following scheduling algorithms:**

**FCFS, SJF (Preemptive), Priority (Non - Preemptive) and Round Robin (Preemptive)**

**1.1 Prerequisite:**

Basic concepts of Scheduling, Different types of scheduling algorithms

**1.2 Learning Objectives:**

Understand the implementation of the Scheduling Algorithms and performance comparative study of Scheduling algorithms

**1.3 New Concepts:****Scheduler:-**

Scheduler is an Operating System module that selects the next job to be admitted into the system & next process to run. There are major three types of scheduler basically as follows:-

- 1. Short Term Scheduler**
- 2. Mid Term Scheduler**
- 3. Long Term Scheduler**

**Scheduling :-**

Scheduling is the method specified by some means is assigned to resources that complete the work; work may be either virtual computation elements like thread, processes, data flows etc. There is Major two types of scheduling algorithm to solve any sort of operations.

**Preemptive Scheduling**

Processor can be preempted to execute a different process in the middle of execution of any current process.

CPU utilization is more compared to Non-Preemptive Scheduling.

Waiting time and Response time is less.

The preemptive scheduling is prioritized. The highest priority process should always be the process that is currently utilized.

If a high priority process frequently arrives in the ready queue, low priority process may starve.

Preemptive scheduling is flexible.

Ex:- Priority, Round Robin, etc.

**Non-Preemptive Scheduling**

Once Processor starts to execute a process it must finish it before executing the other. It cannot be paused in middle.

CPU utilization is less compared to Preemptive Scheduling.

Waiting time and Response time is more.

When a process enters the state of running, the state of that process is not deleted from the scheduler until it finishes its service time.

If a process with long burst time is running CPU, then another process with less CPU burst time may starve.

Non-preemptive scheduling is rigid.

Ex:- FCFS, SJF, Priority, etc.

## 1.4 Scheduling Algorithms:-

1. FCFS (First Come First Serve)
2. SJF (Shortest Job First)
3. Priority
4. Round Robin

### 1.4.1 FCFS CPU SCHEDULING ALGORITHM :-

For FCFS scheduling algorithm, read the number of processes/jobs in the system, their CPU burst times. The scheduling is performed on the basis of arrival time of the processes irrespective of their other parameters. Each Process will be executed according to its arrival time. Calculate the waiting time and turnaround time of each of the processes accordingly.

Process	Arrival Time	Execute Time	Service Time
P0	0	5	0
P1	1	3	5
P2	2	8	8
P3	3	6	16



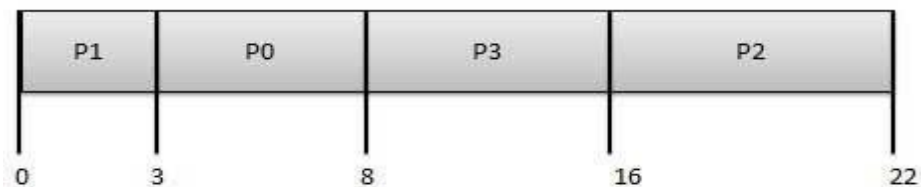
Process	Wait Time : Service Time - Arrival Time
P0	$0 - 0 = 0$
P1	$5 - 1 = 4$
P2	$8 - 2 = 6$
P3	$16 - 3 = 13$

$$\text{Average Wait Time: } (0+4+6+13) / 4 = 5.75$$

### 1.4.2 SJF CPU SCHEDULING ALGORITHM

For SJF scheduling algorithm, read the number of processes/jobs in the system, Their CPU burst times arrange all the jobs in order with respect to their burst times. There may be two jobs in queue with the same execution time, and then FCFS approach is to be performed. Each process will be executed according to the length of its burst time. Then calculate the waiting time and turnaround time of each of the processes accordingly

Process	Arrival Time	Execute Time	Service Time
P0	0	5	3
P1	1	3	0
P2	2	8	16
P3	3	6	8



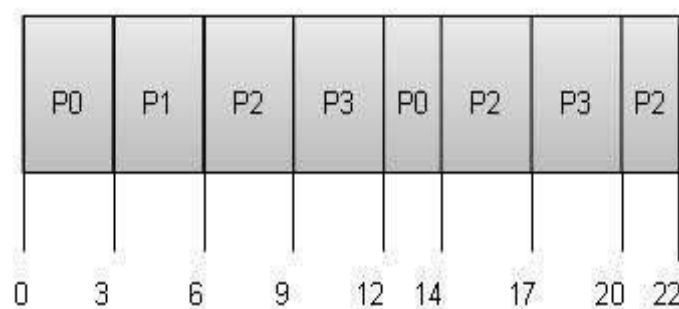
Process	Wait Time : Service Time - Arrival Time
P0	$3 - 0 = 3$
P1	$0 - 0 = 0$
P2	$16 - 2 = 14$
P3	$8 - 3 = 5$

**Average Wait Time:**  $(3+0+14+5) / 4 = 5.50$

### 1.4.3 ROUND ROBIN CPU SCHEDULING ALGORITHM

For Round Robin scheduling algorithm, read the number of processes/jobs in the system, their CPU burst times, and the size of the time slice. Time slices are assigned to each process in equal portions and in circular order, handling all processes execution. This allows every process to get an equal chance. Calculate the waiting time and turnaround time of each of the processes accordingly.

Quantum = 3



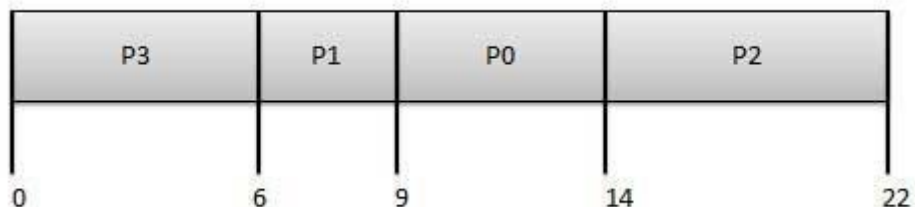
Process	Wait Time : Service Time - Arrival Time
P0	$(0 - 0) + (12 - 3) = 9$
P1	$(3 - 1) = 2$
P2	$(6 - 2) + (14 - 9) + (20 - 17) = 12$
P3	$(9 - 3) + (17 - 12) = 11$

**Average Wait Time:**  $(9+2+12+11) / 4 = 8.5$

### 1.2.4 PRIORITY CPU SCHEDULING ALGORITHM

For priority scheduling algorithm, read the number of processes/jobs in the system, their CPU burst times, and the priorities. Arrange all the jobs in order with respect to their priorities. There may be two jobs in queue with the same priority, and then FCFS approach is to be performed. Each process will be executed according to its priority. Calculate the waiting time and turnaround time of each of the processes accordingly.

Process	Arrival Time	Execute Time	Priority	Service Time
P0	0	5	1	9
P1	1	3	2	6
P2	2	8	1	14
P3	3	6	3	0



Process	Wait Time : Service Time - Arrival Time
P0	$9 - 0 = 9$
P1	$6 - 1 = 5$
P2	$14 - 2 = 12$
P3	$0 - 0 = 0$

$$\text{Average Wait Time: } (9+5+12+0) / 4 = 6.5$$

### 1.5 Assignment Questions:

1. What is meant by scheduling?
2. Write short note on:- a) CPU Utilization b)Throughput c) TA Time d) Waiting Time
3. Write short note on different types of scheduler
4. Difference between SJF & Priority Scheduling.
5. How to differentiate Preemptive & Non-Preemptive scheduling algorithms with the help of example.