CPU Scheduling Algorithms: Priority Scheduling and First-Come, First-Serve (FCFS)

Scheduling Algorithms Implemented

This project implements two CPU scheduling algorithms:

1. **Priority Scheduling**: This algorithm schedules processes based on their priority values. A process with a lower priority number is given higher precedence. If two processes have the same priority, the First-Come, First-Serve (FCFS) rule is applied to determine the order of execution.

2. **First-Come, First-Serve (FCFS)**: In this algorithm, processes are executed in the order they arrive, without considering priority or burst time. The first process to arrive is scheduled for execution first.

Both algorithms compute the following for each process:

- **Completion Time (CT)**: When a process finishes execution.
- **Turnaround Time (TAT)**: Calculated as: TAT= CT - Arrival Time
- **Waiting Time (WT)**: Calculated as: WT= TAT - Burst Time
- **Gantt Chart**: A graphical representation of the order in which processes are executed.

Sample Test Cases and Results

The following sample test case was used to test both scheduling algorithms:

Input Data:

processes.txt

```
PID Arrival_Time Burst_Time Priority
1 0 5 2
2 2 3 1
3 4 2 3
4 5 1 4
5 6 4 2
6 7 2 2
7 8 3 1
8 9 2 3
```

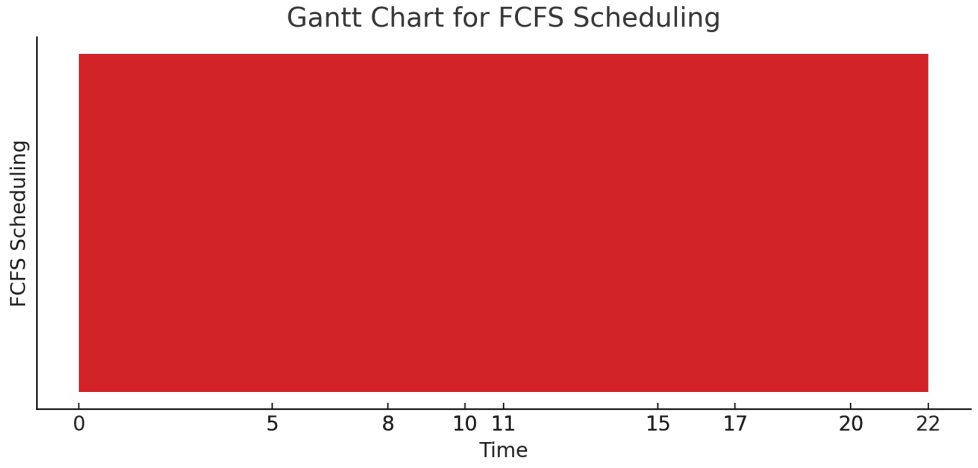
Priority Scheduling Results:

```
PROBLEMS 3  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS  COMMENTS                Run: PriorityScheduling
yateekagoyal@Yateekas-MacBook-Air Operating-sytems-Projects %  /usr/bin/env /Library/Java/JavaVirtu
alMachines/jdk-21.jdk/Contents/Home/bin/java -XX:+ShowCodeDetailsInExceptionMessages -cp /Users/yat
eekagoyal/Library/Application\ Support/Code/User/workspaceStorage/8a247d0944547ba07487a36a8ce4e4df/
redhat.java/jdt_ws/Operating-sytems-Projects_64db6165/bin PriorityScheduling
PID: 2 | Arrival: 2 | Burst: 3 | Priority: 1 | Completion Time: 5 | Turnaround Time: 3 | Waiting Time: 0
PID: 7 | Arrival: 8 | Burst: 3 | Priority: 1 | Completion Time: 11 | Turnaround Time: 3 | Waiting Time: 0
PID: 1 | Arrival: 0 | Burst: 5 | Priority: 2 | Completion Time: 16 | Turnaround Time: 16 | Waiting Time: 11
PID: 5 | Arrival: 6 | Burst: 4 | Priority: 2 | Completion Time: 20 | Turnaround Time: 14 | Waiting Time: 10
PID: 6 | Arrival: 7 | Burst: 2 | Priority: 2 | Completion Time: 22 | Turnaround Time: 15 | Waiting Time: 13
PID: 3 | Arrival: 4 | Burst: 2 | Priority: 3 | Completion Time: 24 | Turnaround Time: 20 | Waiting Time: 18
PID: 8 | Arrival: 9 | Burst: 2 | Priority: 3 | Completion Time: 26 | Turnaround Time: 17 | Waiting Time: 15
PID: 4 | Arrival: 5 | Burst: 1 | Priority: 4 | Completion Time: 27 | Turnaround Time: 22 | Waiting Time: 21

Average Turnaround Time: 13.75
Average Waiting Time: 11.00
yateekagoyal@Yateekas-MacBook-Air Operating-sytems-Projects %
```

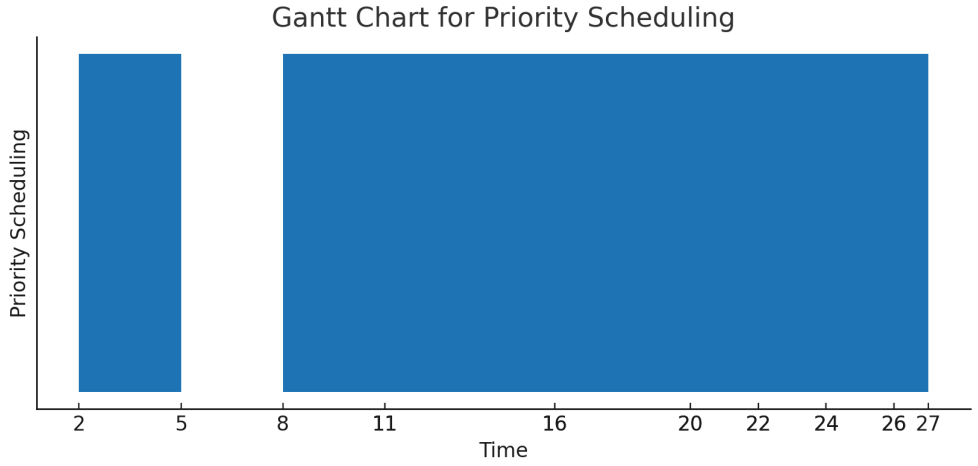
FCFS Scheduling Results:

```
PROBLEMS 14  OUTPUT  TERMINAL  ...                Run: FCFS_Scheduling
yateekagoyal@Yateekas-MacBook-Air Operating-sytems-Projects %  /usr/bin/env /Library/Java/JavaVirtu
alMachines/jdk-21.jdk/Contents/Home/bin/java -XX:+ShowCodeDetailsInExceptionMessages -cp /Users/yat
eekagoyal/Library/Application\ Support/Code/User/workspaceStorage/aef7aed382473f6020a1d7efe9990cf9/
redhat.java/jdt_ws/Operating-sytems-Projects_64db6165/bin FCFS_Scheduling
Running FCFS Scheduling...
PID: 1 | Arrival: 0 | Burst: 5 | Completion: 5 | Turnaround: 5 | Waiting: 0
PID: 2 | Arrival: 2 | Burst: 3 | Completion: 8 | Turnaround: 6 | Waiting: 3
PID: 3 | Arrival: 4 | Burst: 2 | Completion: 10 | Turnaround: 6 | Waiting: 4
PID: 4 | Arrival: 5 | Burst: 1 | Completion: 11 | Turnaround: 6 | Waiting: 5
PID: 5 | Arrival: 6 | Burst: 4 | Completion: 15 | Turnaround: 9 | Waiting: 5
PID: 6 | Arrival: 7 | Burst: 2 | Completion: 17 | Turnaround: 10 | Waiting: 8
PID: 7 | Arrival: 8 | Burst: 3 | Completion: 20 | Turnaround: 12 | Waiting: 9
PID: 8 | Arrival: 9 | Burst: 2 | Completion: 22 | Turnaround: 13 | Waiting: 11

Average Turnaround Time: 8.38
Average Waiting Time: 5.63
yateekagoyal@Yateekas-MacBook-Air Operating-sytems-Projects %
```

Gantt Chart: For each algorithm, a Gantt chart visualizing the execution order of processes is displayed.



```
Textual Gantt Chart Representation (FCFS):
| P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8
  5    8    10    11    15    17    20    22
```




```
Textual Gantt Chart Representation (Priority):
| P2 | P7 | P1 | P5 | P6 | P3 | P8 | P4
  5    11    16    20    22    24    26    27
```

Challenges Faced

- **Input Validation**: Ensuring that the input file was in the correct format (i.e., PID, arrival time, burst time, priority).
- **Handling Ties in Priority**: Implementing the FCFS rule correctly when two processes have the same priority.
- **Time Calculations**: Ensuring that the turnaround and waiting times are computed accurately for each process.