Overview

- FCFS
- SJF Non-Preemptive
- SJF Preemptive
- Priority scheduling
- Lottery scheduling
## FCFS

<table>
<thead>
<tr>
<th>Process ID</th>
<th>Arrival Time</th>
<th>Duration</th>
<th>Waiting Time</th>
<th>Turnaround Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>0</td>
<td>3</td>
<td>0-0=0</td>
<td>3+0=3</td>
</tr>
<tr>
<td>P2</td>
<td>2</td>
<td>5</td>
<td>3-2=1</td>
<td>5+1=6</td>
</tr>
<tr>
<td>P3</td>
<td>8</td>
<td>2</td>
<td>10-8=2</td>
<td>2+2=4</td>
</tr>
<tr>
<td>P4</td>
<td>4</td>
<td>2</td>
<td>8-4=4</td>
<td>2+4=6</td>
</tr>
</tbody>
</table>

- Average waiting time = (0+1+2+4)/4

- Throughput = 4 jobs/ 12 sec = 0.3 jobs/sec
### SJF Non-Preemtpive

<table>
<thead>
<tr>
<th>Process ID</th>
<th>Arrival Time</th>
<th>Duration</th>
<th>Waiting Time</th>
<th>Turnaround Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>0</td>
<td>5</td>
<td>0-0=0</td>
<td>5+0=5</td>
</tr>
<tr>
<td>P2</td>
<td>2</td>
<td>3</td>
<td>7-2=4</td>
<td>3+4=7</td>
</tr>
<tr>
<td>P3</td>
<td>8</td>
<td>2</td>
<td>10-8=2</td>
<td>2+2=4</td>
</tr>
<tr>
<td>P4</td>
<td>4</td>
<td>2</td>
<td>5-4=1</td>
<td>2+1=3</td>
</tr>
</tbody>
</table>

- Average waiting time = (0+4+2+1)/4

- Throughput = 4 jobs/ 12 sec = 0.3 jobs/sec
## SJF Preemptive

<table>
<thead>
<tr>
<th>Process ID</th>
<th>Arrival Time</th>
<th>Duration</th>
<th>Waiting Time</th>
<th>Turnaround Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>0</td>
<td>7</td>
<td>(0-0)+(11-2) = 9</td>
<td>7+9 = 16</td>
</tr>
<tr>
<td>P2</td>
<td>2</td>
<td>4</td>
<td>(2-2)+(5-4) = 1</td>
<td>4+1 = 5</td>
</tr>
<tr>
<td>P3</td>
<td>4</td>
<td>1</td>
<td>4-4 = 0</td>
<td>1+0 = 1</td>
</tr>
<tr>
<td>P4</td>
<td>5</td>
<td>4</td>
<td>7-5 = 2</td>
<td>4 +2 = 6</td>
</tr>
</tbody>
</table>

- **Average waiting time** = \((9+1+0+2)/4\)

- **Throughput** = 4 jobs/ 16 sec = 0.25 jobs/sec
## Priority Scheduling

<table>
<thead>
<tr>
<th>Process ID</th>
<th>Priority</th>
<th>Duration</th>
<th>Waiting Time</th>
<th>Turnaround Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>3</td>
<td>10</td>
<td>1</td>
<td>10+1=11</td>
</tr>
<tr>
<td>P2</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1+0=1</td>
</tr>
<tr>
<td>P3</td>
<td>4</td>
<td>2</td>
<td>11</td>
<td>2+11=13</td>
</tr>
<tr>
<td>P4</td>
<td>5</td>
<td>1</td>
<td>13</td>
<td>1+13=14</td>
</tr>
</tbody>
</table>

- Average waiting time = (1+0+11+13)/4

- Throughput = 4 jobs / 14 sec = 0.29 jobs/sec
Lottery Scheduling

- If total number of tickets is 20

<table>
<thead>
<tr>
<th>Process ID</th>
<th>No. of Tickets</th>
<th>Ticket numbers</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>9</td>
<td>1 to 9</td>
<td>3</td>
</tr>
<tr>
<td>P2</td>
<td>5</td>
<td>10 to 14</td>
<td>5</td>
</tr>
<tr>
<td>P3</td>
<td>6</td>
<td>15 to 20</td>
<td>1</td>
</tr>
</tbody>
</table>

Per time slice, the scheduler should do the following:
- Choose a random number between 1-20
- Suppose, if random number chosen is 11 then the process P2 is selected by scheduler for execution
- After Process P2 complete execution, the remaining tickets in P2 are sent to the process with highest number of tickets

* Then for next time slice, the above steps should be repeated with remaining tickets and processes
References

http://wiki.osdev.org/Scheduling_Algorithms

http://www.tutorialspoint.com/operating_system/os_process_scheduling_algorithms.htm