* System Calls
* Virtual Memory
  + Page tables
  + TLB
* Process vs Threads
  + Advantages vs Disadvantaged
  + Fork()
  + Zombies
  + Orphans
  + User vs Kernel threads: advantages vs disadvantages
* Signals
  + Signal handlers
  + 5 Signals default actions
  + Signal Functions (many…)
* Deadlocks
  + 4 reasons for deadlock
  + 4 ways to avoid deadlock.
  + The banker’s algorithm
* Synchronize
  + Strict Alternation (why is it bad?)
  + Peterson’s algorithm
  + Bakery’s algorithm
  + Semaphores VS mutex
* Dining Philosophers
* Real Time Operating Systems
  + Hard VS Soft real-time-os
  + Safety Critical System
  + Earliest Deadline First (EDF)
  + Rate-Monotonic (RM) VS Deadline-Monotonic (DM)
* Priority Inversion (Under RT-OS)
  + Unbounded Priority Inversion
  + Bounded Priority Inversion
  + Priority Inheritance
  + Ceiling Priority Protocol (CPP)
* Semaphores
  + Binary Semaphore
  + Counting Semaphore
  + Implement Counting semaphore using 2 Binary semaphores.
* Scheduling
  + Preemptive vs non-preemptive
  + First-come, First-served (FCFS)
  + Shortest Job First (SJF)
  + Shortest Remaining Time First (SRTF)
  + Highest Response Ratio Next (HRRN)
  + Round Robin
  + Priority Queue Scheduling
  + Multi-Level Queue Scheduling

Highest Response Ratio Next



Information that we will receive:

|  |  |  |
| --- | --- | --- |
| Process number | Arrival Time | Burst Time |
| 0 | 0 | 3 |
| 1 | 2 | 6 |
| 2 | 4 | 4 |
| 3 | 6 | 5 |
| 4 | 8 | 2 |

Order + Running Time of entire processes:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P0 – arrival time is 0 | P1 – no other process has arrived until this time | P2 | P4 | P3 |



Now we don’t know who’s going to be next after P1 so we are going to calculate the response ratio

Formula to calculate ratio =

\* Waiting time is: 9

**RR­2 =**

RR3 =

RR4 =

We now choose the process with the highest ratio which is RR2

Choose next one:

\*Waiting time is: 13

RR3 =

**RR4 =**