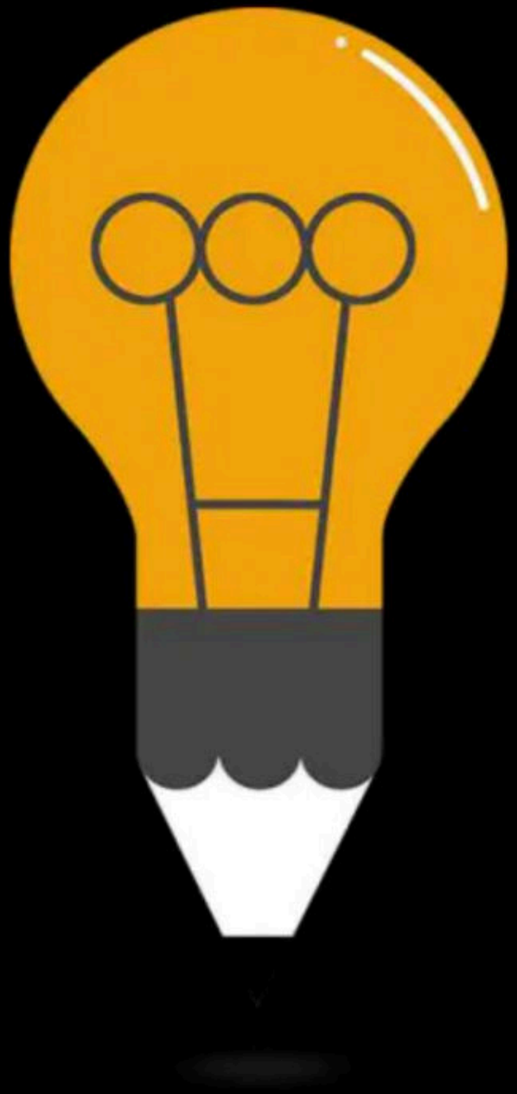
CPU Scheduling Algorithms - II

Comprehensive Course on Operating System

Vishvadeep Gothi • Lesson 6 • Aug 27, 2021



Operating System
CPU Scheduling 2

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Vishvadeep Gothi

- **GATE Ranks:**
  - 682 (2009) – 3rd year
  - 19 (2010) – 4th year
  - 119, 440 etc.
- **Education:**
  - ME from IISc Bangalore
  - Mtech from BITS-pilani in Data Science
- **Work:**
  - 14+ Year Teaching Experience
  - 9+ in GATE/IES (GateForum, Gate Academy, ACE)
  - Worked in Cisco, Audience Communication
- **Professions:**
  - Freelance S/W developer
  - Educator
  - CrossFit Trainer

Scheduling Algorithms

- ✓ FCFS
- ✓ SJF
- ✓ SRTF

1. HRRN
2. Priority Based
3. Round Robin
4. Multilevel Queue Scheduling
5. Multilevel Feedback Queue Scheduling

SRTF (Shortest Remaining Time First)

Process	Arrival Time	Burst Time	Completion Time	Turnaround Time	Waiting Time
P1	4	7			
P2	5	5			
P3	3	1			
P4	1	2			
P5	2	1			
P6	0	4			

SRTF (Shortest Remaining Time First)

Advantages:

1. Minimum average waiting time among all scheduling algorithm
2. Better throughput in continue run

Disadvantages:

1. No practical implementation because Burst time is not known in advance
2. Longer Processes may suffer from starvation

HRRN (Highest Response Ratio Next)

Objective: Not only favors short jobs but decreases the WT of longer jobs.

Criteria: Response Ratio

Mode: Non-preemptive

$$Resonse\ Ratio = \frac{W+S}{S}$$

W = Wait Time

S = Service/Burst Time

HRRN (Highest Response Ratio Next)

Process	Arrival Time	Burst Time
P1	0	3
P2	2	6
P3	4	4
P4	6	5
P5	8	2

HRRN (Highest Response Ratio Next)

Process	Arrival Time	Burst Time
P1	0	3
P2	2	6
P3	4	4
P4	6	5
P5	8	2

Priority Based Algorithm

Criteria: Priority

Mode: Preemptive/Non-preemptive

Priority:

1. Static
2. Dynamic

Priority Based Algorithm

Process	Arrival Time	Burst Time	Priority
P1	0	4	4
P2	1	2	5
P3	2	3	6
P4	3	1	10(Highest)
P5	4	2	9
P6	5	6	7

Priority Based Algorithm

Process	Arrival Time	Burst Time	Priority
P1	0	4	4
P2	1	2	5
P3	2	3	6
P4	3	1	10(Highest)
P5	4	2	9
P6	5	6	7

Priority Based Algorithm Question Non-Preemptive

Process	Arrival Time	Burst Time	Priority
P1	0	7	9
P2	1	3	4
P3	2	5	2
P4	3	2	1 (Highest)
P5	4	6	3
P6	5	1	8

Priority Based Algorithm Question Preemptive

Process	Arrival Time	Burst Time	Priority
P1	0	7	9
P2	1	3	4
P3	2	5	2
P4	3	2	1 (Highest)
P5	4	6	3
P6	5	1	8

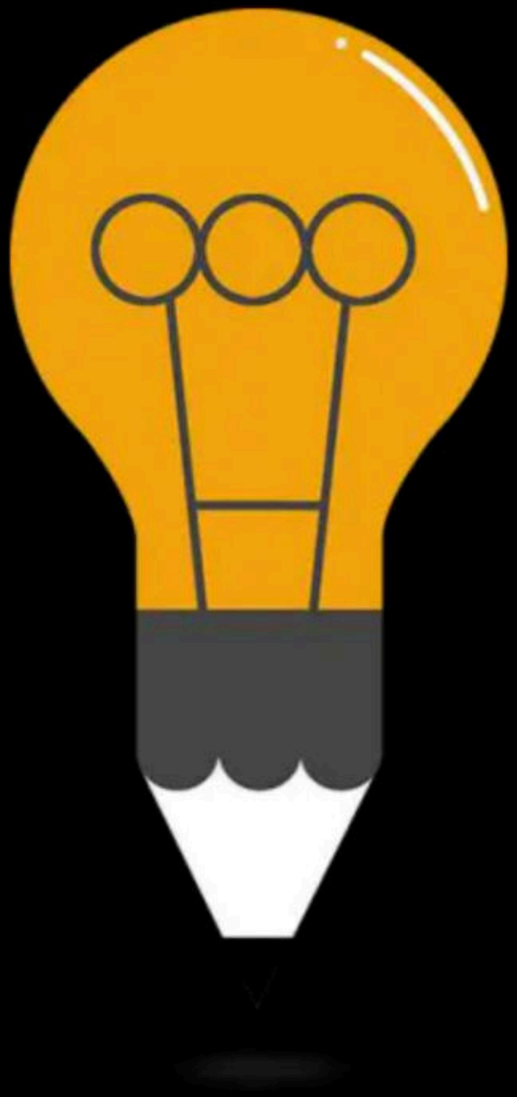
Priority Based Algorithm

Advantages:

1. Better response for real time situations

Disadvantages:

1. Low Priority Processes may suffer from starvation



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Question 1

Consider the following set of processes:

Process	Arrival Time	Burst Time
P1	0	10ms
P2	0	29ms
P3	0	3ms
P4	0	7ms
P5	0	12ms

Calculate average waiting time for:
FCFS, Non-preemptive SJF, SRTF and Round-robin (quantum = 10ms)

Question 2

Four processes to be executed on a single processor system arrives at time 0+ in the order A, B, C and D. Their CPU burst time requirements are 4, 1, 8, 1 time units respectively. The average waiting time of processes under Round-Robin scheduling with time slice of one time unit is?

Question 3

Three processes with their respective process IDs given by P1, P2 and P3, having estimated burst time of 8ms, 4ms and 2ms respectively, enter a ready queue together in the order P1, P2 and P3. What is the average turn around time in Round Robin scheduling algorithm with time slice 2ms?

Question 4

Consider a scheduling algorithm to select one of the ready processes for execution as follows:

1. If only one process is available in ready queue, then select is without any condition
2. If more than one processes are available in ready queue, then calculate waiting time of each process and select the process with minimum waiting time

The given algorithm is used on a system where a new process arrives every A nanoseconds after the first process arriving at time 0. Each process takes B nanoseconds to run on CPU. If A>=B then the given algorithm works as:

(A) FCFS
(B) FJF
(C) Non-preemptive Priority based algo with priority of process is inversely proportional to waiting time
(D) Non-preemptive Priority based algo with priority of process is proportional to waiting time

Question 5

On a system using round robin CPU scheduling, context-switch overhead is given by ‘s’. Time quantum is ‘q’. The CPU efficiency is?

(A)50%
(B)Zero
(C)100%
(D)Not predictable

Question 6 GATE-2006

Consider three processes (process id 0, 1, 2 respectively) with compute time bursts 2, 4 and 8 time units. All processes arrive at time zero. Consider the longest remaining time first (LRTF) scheduling algorithm. In LRTF ties are broken by giving priority to the process with the lowest process id. The average turn around time is:

(A) 13 units
(B) 14 units
(C) 15 units
(D) 16 units

Happy Learning.!