

# Operating System: HRRN & Priority Based Algo

By: Vishvadeep Gothi



# VISHVADEEP GOTHI SIR

# AIR 19

in GATE 2010



**ME from IISc Bangalore  
MTech BITS Pilani (Data Sc.)**



**13+ Years of Teaching Experience,  
9+ Years in GATE/IES**



**Subjects Taken:**  
Computer Organization,  
Data Structure, OS, C-  
Coding Interview Problems

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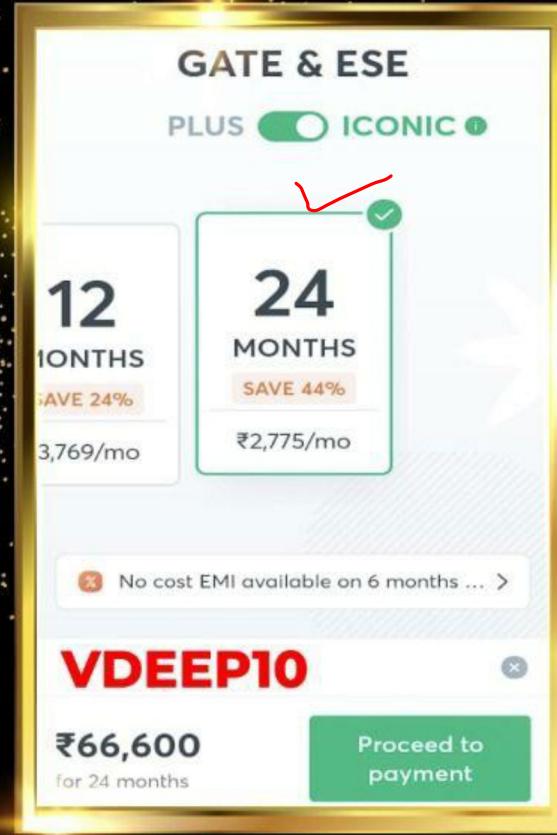
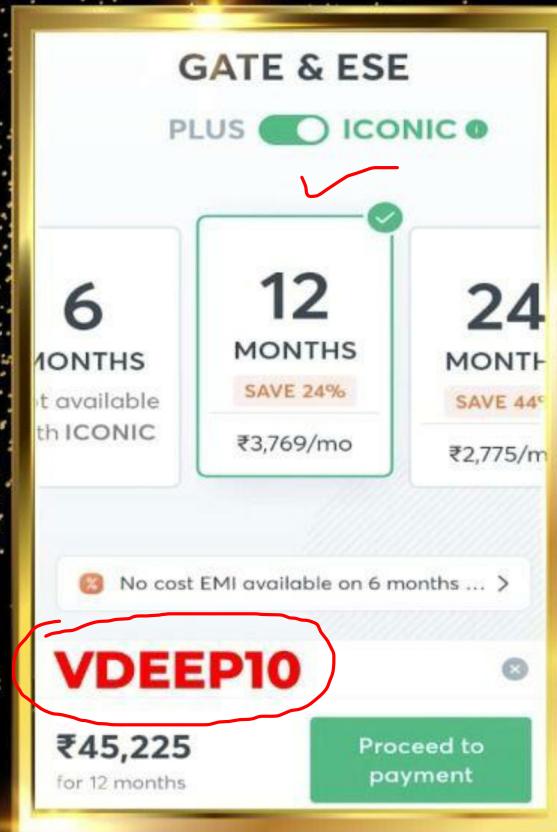
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# Problems with SJF & SRTF

- 
1. Starvation → *indefinite waiting*
  2. No fairness ✓
  3. Practical Implementation is not possible



# HRRN (Highest Response Ratio Next)

- ◎ Objective: Not only favors short jobs but decreases the WT of longer jobs
- ◎ Criteria: Response Ratio
  - Tie-breaker: BT
- ◎ Type: Non-preemptive



# HRRN (Highest Response Ratio Next)

- ◎ Objective: Not only favors short jobs but decreases the WT of longer jobs
- ◎ Criteria:
  - Tie-breaker:

$$RR = \frac{W + S}{S}$$

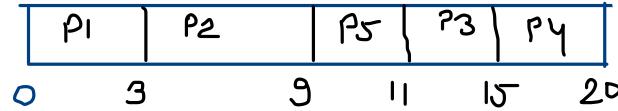
$W$  = Wait Time

$S$  = Service/Burst Time

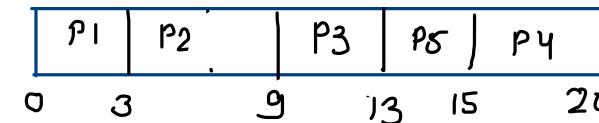
# HRRN (Highest Response Ratio Next)

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

SJT :-



HRRN :-



At time 13 :-

$$RR(P_4) = \frac{7+5}{5} = 2.4$$

$$RR(P_5) = \frac{5+2}{2} = 3.5$$

High

At time 9 :-

$$RR(P_5) = \frac{5+4}{4} = 2.25$$

(Highest)

$$RR(P_4) = \frac{3+5}{5} = 1.3$$

$$RR(P_5) = \frac{1+2}{2} = 1.5$$

# HRRN (Highest Response Ratio Next)

Process	Arrival Time	Burst Time	Completion Time	Turnaround Time	Waiting Time
P1	0	3	3	3	0
P2	2	6	9	7	1
P3	4	4	13	9	5
P4	6	5	20	14	9
P5	8	2	15	7	5

$$\text{avg TAT} = \frac{40}{5} = 8$$

$$\text{avg WT} = \frac{20}{5} = 4$$

# Priority Based Scheduling

- ◎ Criteria: Priority
  - Tie-breaker: FCFS
- ◎ Type:
  - Non-preemptive
  - Preemptive



# Priority

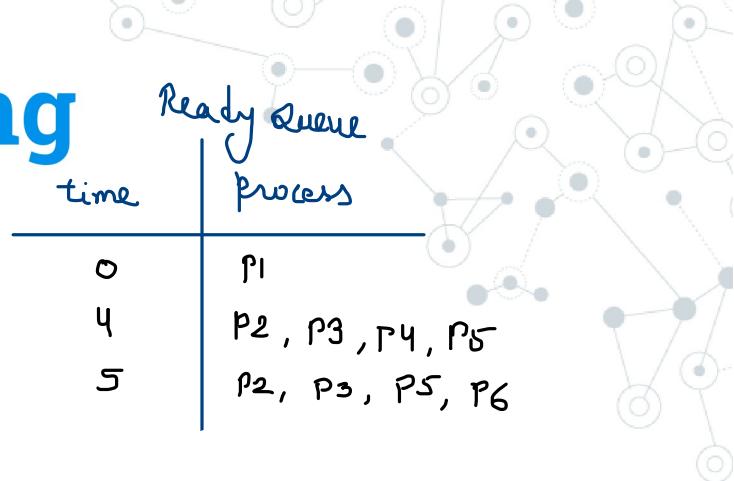
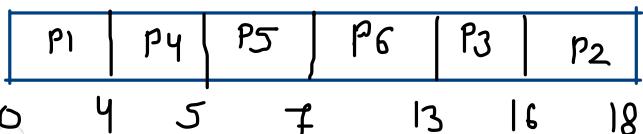
- ✓ Static → fixed
- Dynamic → may increase  
or  
decrease



# Priority Based Scheduling

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

non-preemptive



# Priority Scheduling: Non-Preemptive

CT - AT      TA T - BT

Process	Arrival Time	Burst Time	Priority	Completion Time	Turnaround Time	Waiting Time
P1	0	4	4	4	4	0
P2	1	2	5	18	17	15
P3	2	3	6	16	14	11
P4	3	1	10(Highest)	5	2	1
P5	4	2	9	7	3	1
P6	5	6	7	13	8	2

$$\text{avg TA T} = \frac{48}{6} = 8$$

$$\text{avg WT} = \frac{30}{6} = 5$$

# Priority Scheduling: Non-Preemptive



# Priority Scheduling: Preemptive

Process	Arrival Time	Burst Time	Priority	Completion Time	Turnaround Time	Waiting Time
P1	0	4	4	18	18	14
P2	1	2	5	15	14	12
P3	2	3	6	14	12	9
P4	3	1	10(Highest)	4	1	0
P5	4	2	9	6	2	0
P6	5	6	7	12	7	1

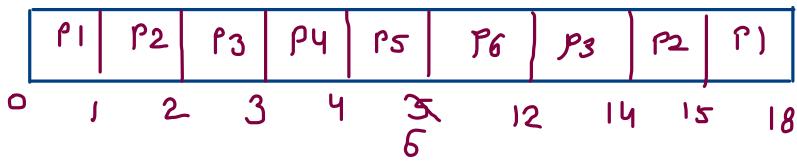
$$\text{avg TAT} = \frac{54}{6}$$

$$\text{avg WT} = \frac{36}{6}$$

= 9

= 6

# Priority Scheduling: Preemptive



time	Ready queue Process
0	P1
1	P1, P2
2	P1, P2, P3
3	P1, P2, P3, P4
4	P1, P2, P3, P5
5	P1, P2, P3, <del>P4, P6</del>

Process	BT
P1	4
P2	2
P3	3
P4	X
P5	2
P6	X

# Starvation

If higher priority processes keep arriving then low priority processes may wait till indefinite time.



# Solution of Starvation

:- Aging

- after predefined time period increase priority of all waiting processes by 1.
- only applicable for dynamic priority system.



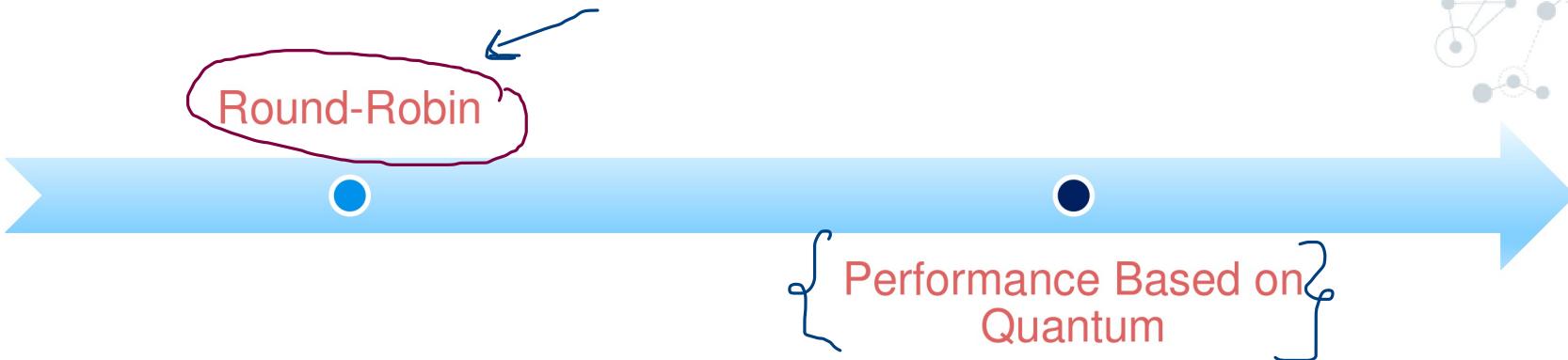
# Question

(Home work)

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



# Next Class



# Mentorship Program: Quiz

10 Questions

ENGLISH DATA STRUCTURES

## Quiz for Mentorship Program: OS and Tree Data Structure

Starts on May 28, 2021 • 9:00 AM

In this session Vishvadeep Gothi will conduct a live quiz for learners on topics, tree data structure and Operating System (Only up to Process Scheduling).

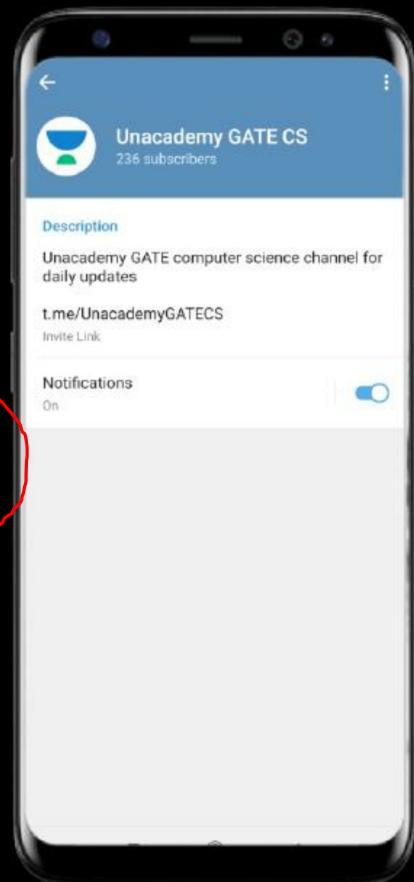


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