

CPU SCHEDULING ALGORITHMS

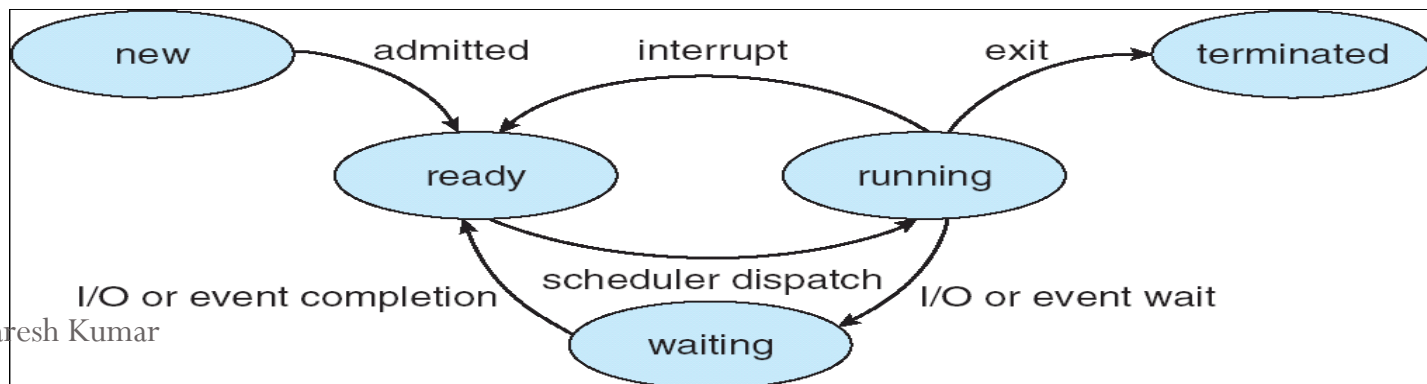
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INTRODUCTION

- The CPU scheduling is used to improve CPU efficiency.
- It is used to allocate resources among competing processes.
- Maximum CPU utilization is obtained with multiprogramming.
 - The processes which are to be executed are in ready queue.
 - Every time the running process is blocked , the process in the ready queue takes over the CPU.

PROCESS STATES

- The 3 states of a process are ready , running and wait states.
- CPU scheduling is affected by the following set of circumstances:
 - A process switches from **running** to **waiting** state.
 - A process switches from **running** to **ready** state .
 - A process switches from **waiting** to **ready** state .
 - A processes switches from **running** to **terminated** state.



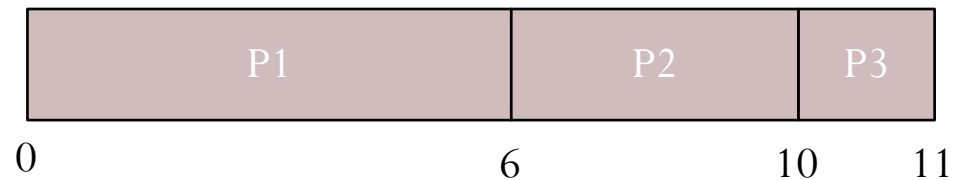
CPU SCHEDULING CRITERIA

- **CPU Utilization:** Percent of time that the CPU is busy executing a process.
- **Throughput:** Number of processes executed per unit time.
- **Turnaround Time:** The interval of time between submission of a process and its completion.
- **Waiting Time:** The amount of time the process spends in the ready queue waiting for the CPU.
- **Response Time:** The time between submission of requests and first response to the request.

First Come First Served(FCFS)

- The process which enters the queue first is executed first.
- It is non-preemptive.

Process	Arrival	Service	TT	WT
P_1	0	6	6	0
P_2	2	4	8	4
P_3	4	1	7	6



FCFS

- Advantages:

It is simple and easy to understand.

- Disadvantages:

The process with less execution time suffer.

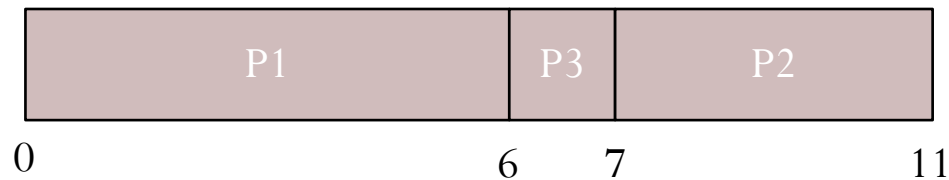
Favours CPU bound process then I/O bound process.



Shortest Job First(SJF)

- The process with the lowest execution time is executed first.
- It can be either preemptive or non preemptive.

Process	Arrival	Service	TT	WT
P_1	0	6	6	0
P_2	2	4	9	5
P_3	4	1	3	2



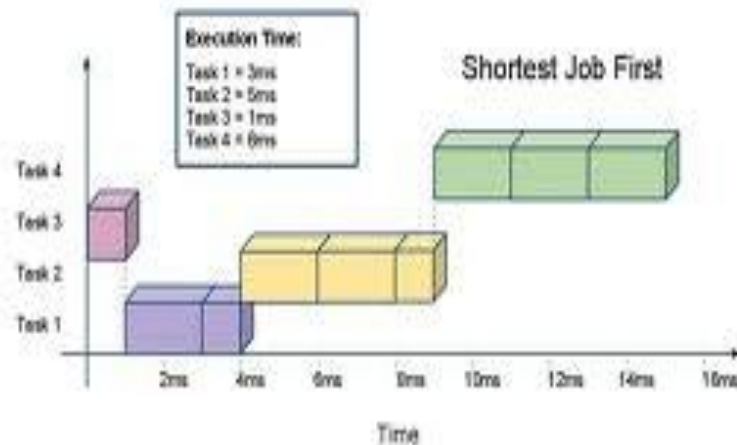
SJF

- Advantages:

Shortest jobs are favoured.

- Disadvantages:

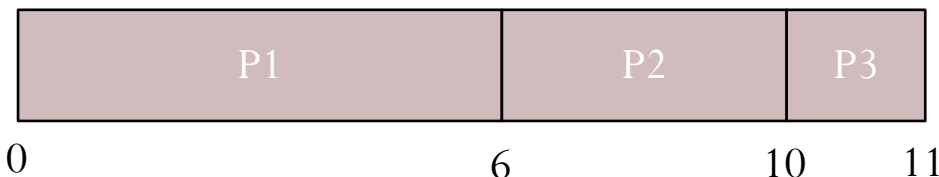
When there are more number of shorter jobs, longer jobs starve.



Priority Scheduling(PS)

- Each process is associated with priority and the CPU is allocated to each of them based on their priorities.
- Multiple process with same priority are dealt using FCFS.

Process	Arrival	Service	TT	WT
P_1	0	6	6	0
P_2	2	4	8	4
P_3	4	1	7	6



PS

- Advantages:

Priority scheduling provides a good mechanism where the relative importance of each process may be precisely defined.

- Disadvantages:

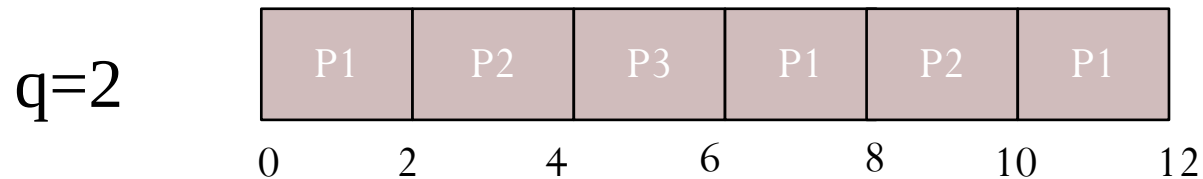
- If high priority processes use up a lot of CPU time, lower priority processes may starve and be postponed indefinitely.
- The situation where a process never gets scheduled to run is called starvation.
- Another problem with priority scheduling is deciding which process gets which priority level assigned to it.

Round Robin(RR)

- Each process is allotted a time slot(q). After this time has elapsed, the process is pre-empted and added to the end of the ready queue.
- Performance of the round robin algorithm
 - q large $\rightarrow$ FCFS
 - q small $\rightarrow q$ must be greater than the context_switch time; otherwise, the overhead is too high

RR

Process	Arrival	Service	TT	WT
P_1	0	6	12	6
P_2	2	4	8	4
P_3	4	2	2	0



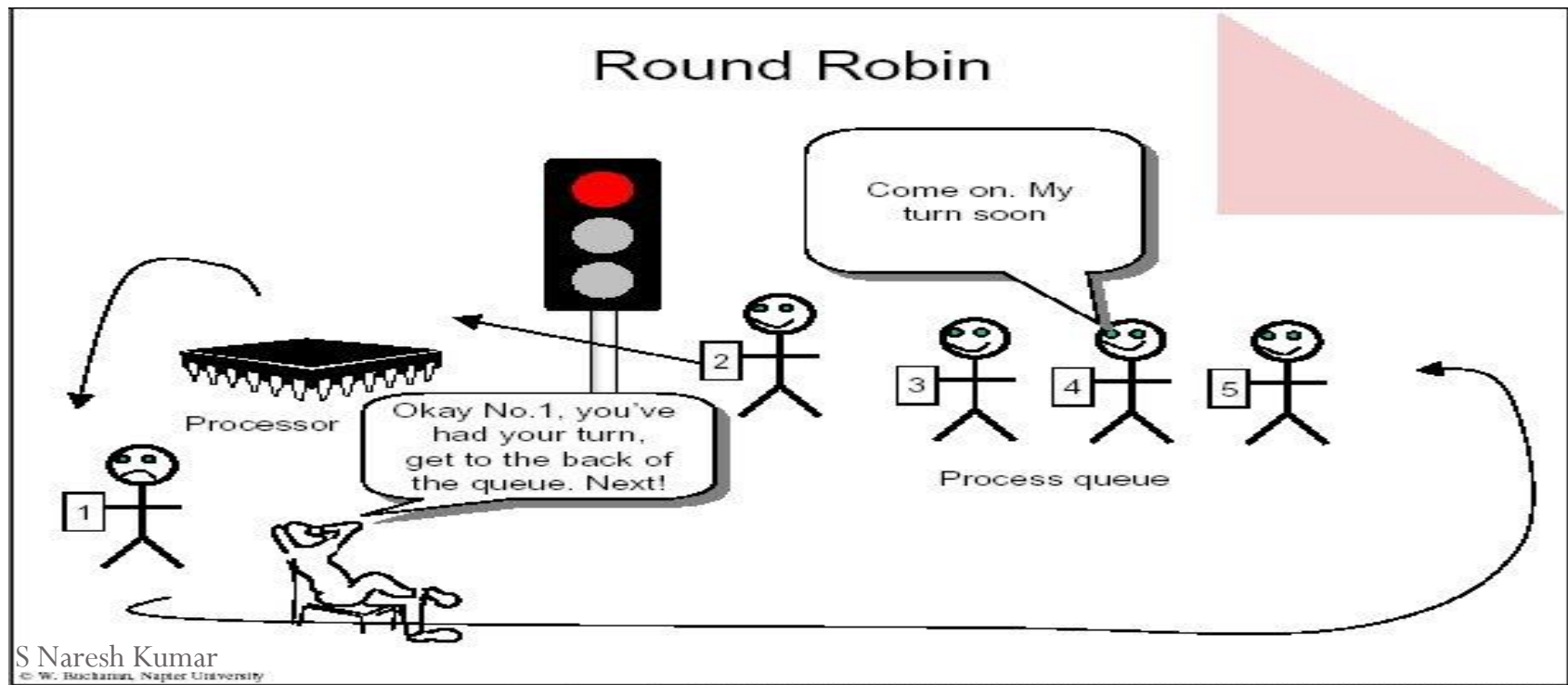
- Advantages:

Round robin scheduling is fair in that every process gets an equal share of the CPU.

RR

- Disadvantages:

Setting the quantum too short, increases the overhead and lowers the CPU efficiency, but setting it too long may cause poor response to short processes.



ANALYSIS AND RESULTS

- Comparing the average turnaround time and waiting time, the algorithms are ranked as SJF,FCFS and PS.
- Based on average CPU utilization the algorithms are ranked as FC,PS and SJF.
- In terms of execution speed, FCFS was found to be consistently faster than PS and SJF.

Thus according to the performance measure the corresponding scheduling algorithm is recommended to the CPU.