JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

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Lecture-17 By Vivek Dubey

COMPUTER SCIENCE AND ENGINEERING

CS403PC

COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

CS403PC

BHARAT INSTITUTE OF ENGINEERING AND TECHNOLOGY

Scheme of Operating System

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S. No.	Course Code	Course Title	L	T	P	Credits
3	CS403PC	Operating Systems	3	0	0	3
6	CS406PC	Operating Systems Lab	0	0	3	1.5

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UNIT-2:

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- **Process and CPU Scheduling –**
  - Process concepts and scheduling, Operations on Processes, Cooperating Processes, Threads, and Interposes Communication, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling.
- **System call interface for process management-**
  - fork, exit, wait, waitpid, exec

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Scheduling Algorithms

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Different Scheduling Algorithms

- *First Come First Serve (FCFS)*
- *Shortest Job First(SJF)*
- *Longest Job First(LJF)*
- *Shortest Remaining Time First(SRTF)*
- *Longest Remaining Time First(LRTF)*
- *Round Robin Scheduling*
- *Priority Based scheduling (Non-Preemptive)*
- *Highest Response Ratio Next (HRRN)*
- *Multilevel Queue Scheduling*
- *Multi level Feedback Queue Scheduling*

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Round Robin Scheduling

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Scheduling Algorithm

- **The name of this algorithm** *comes from the round-robin principle*, where each person gets an equal share of something in turns.
- **It is mostly used** *for multitasking.*
- In Round-robin scheduling, **each ready task** runs turn by turn only in a cyclic queue *for a limited time slice*.
- **This algorithm also offers** *starvation free execution of processes.*

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Characteristics of Round-Robin Scheduling

- **Round robin is** a pre-emptive algorithm
- **The CPU is shifted to** the next process after fixed interval time, *which is called time quantum/time slice.*
- **The process that is preempted is added** to the end of the queue.
- **Round robin is** a hybrid model which is clock-driven.
- **Time slice should be minimum**, which is assigned for a specific task *that needs to be processed*. However, it may differ OS to OS.
- **It is a real time algorithm** which responds to the event *within a specific time limit.*
- **Round robin is** one of the oldest, fairest, and easiest algorithm.
- **Widely used scheduling method** in traditional OS.

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Example of Round-robin Scheduling

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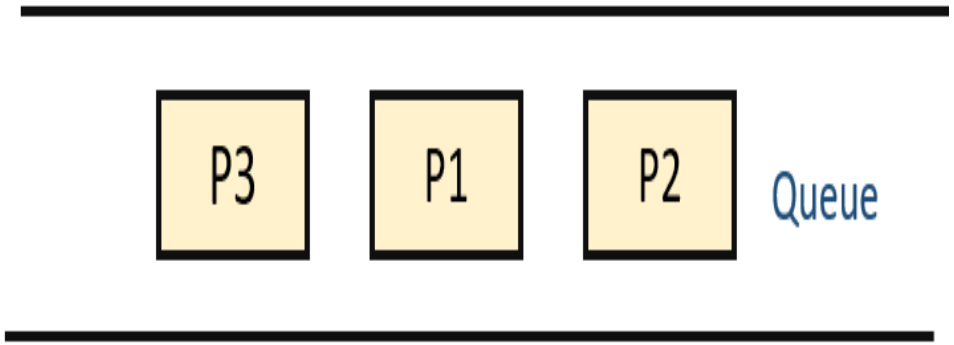
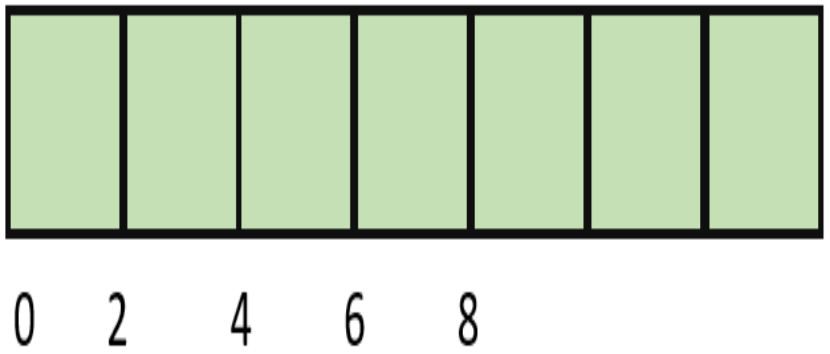
Consider this following three processes

Process Queue	Burst time
P1	4
P2	3
P3	5



Time Slice = 2



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Step 1) The execution begins with process P1, which has burst time 4. Here, every process executes for 2 seconds. P2 and P3 are still in the waiting queue.

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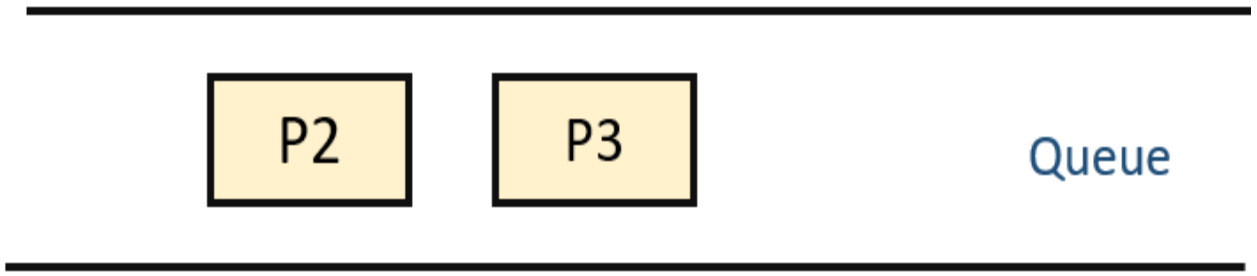
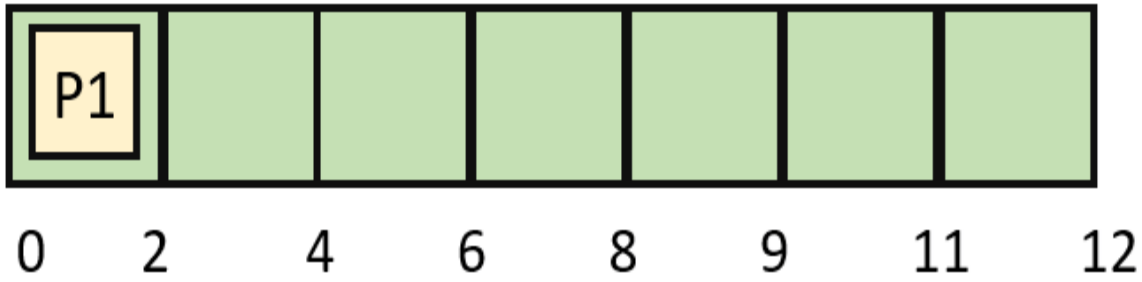
Process Queue	Burst time
P1	4
P2	3
P3	5



Time Slice = 2



Step 2) At time =2, P1 is added to the end of the Queue and P2 starts executing.

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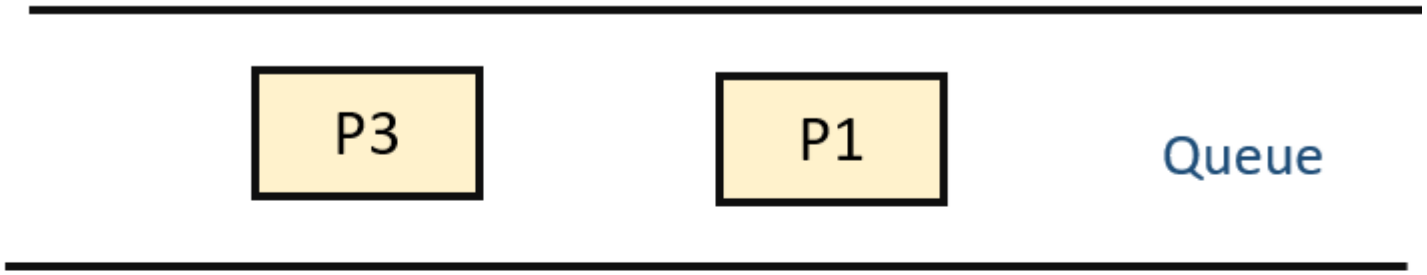
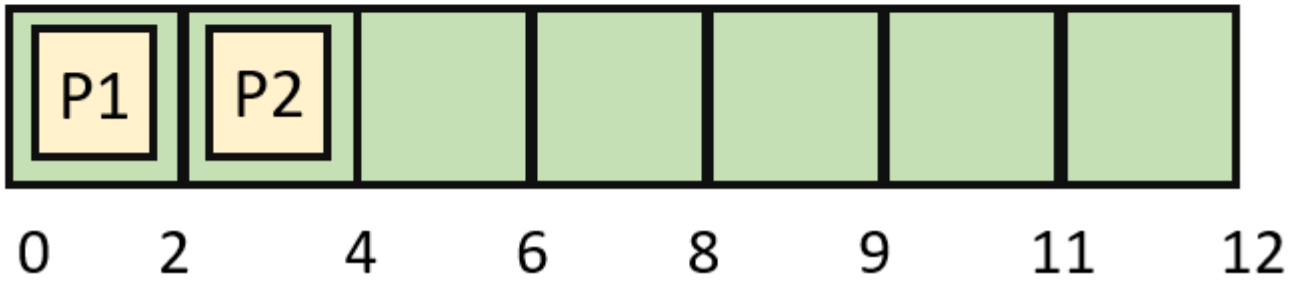
Process Queue	Burst time
P1	4
P2	3
P3	5



Time Slice = 2



Step 3) At time=4 , P2 is preempted and add at the end of the queue. P3 starts executing.

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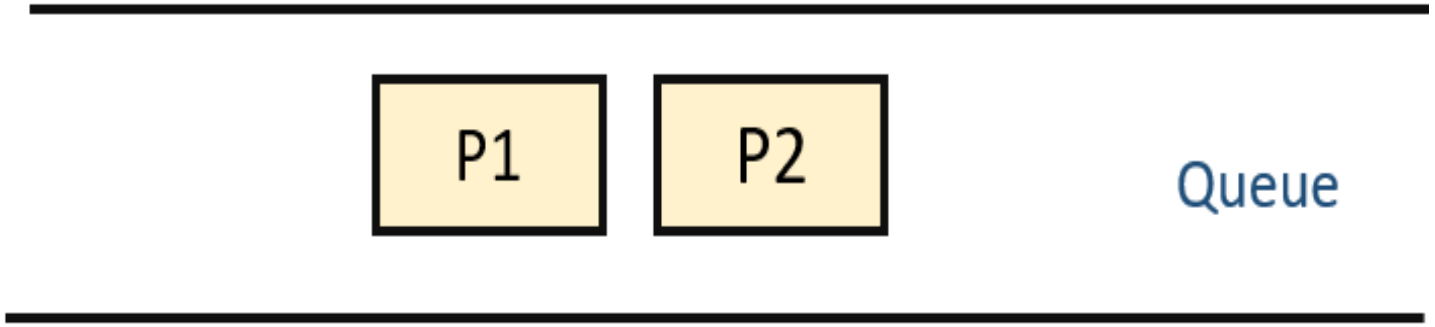
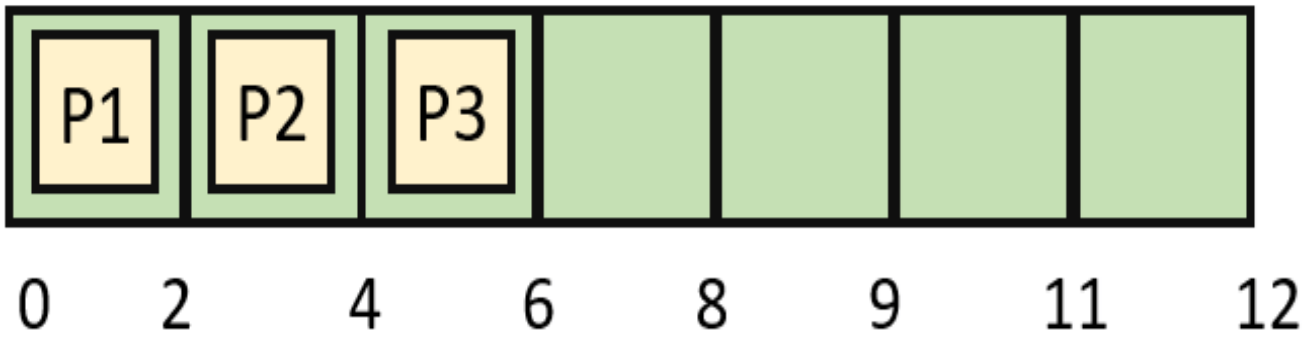
Process Queue	Burst time
P1	4
P2	3
P3	5



Time Slice = 2



Step 4) At time=6, P3 is preempted and add at the end of the queue. P1 starts executing.

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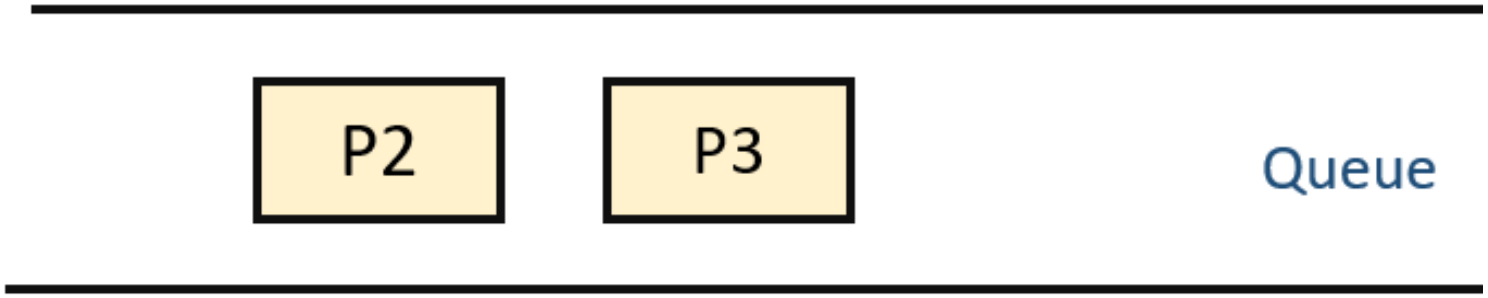
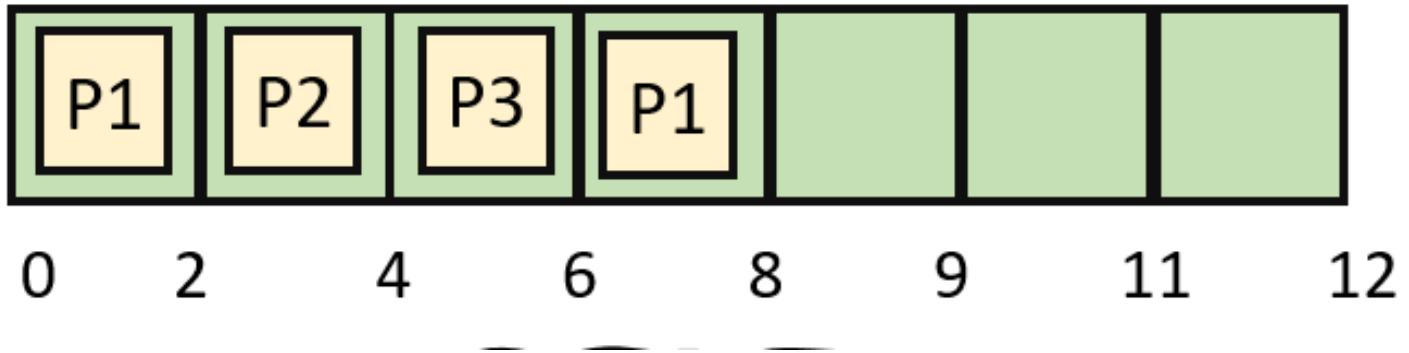
Process Queue	Burst time
P1	4
P2	3
P3	5



Time Slice = 2



Step 5) At time=8 , P1 has a burst time of 4. It has completed execution. P3 starts execution

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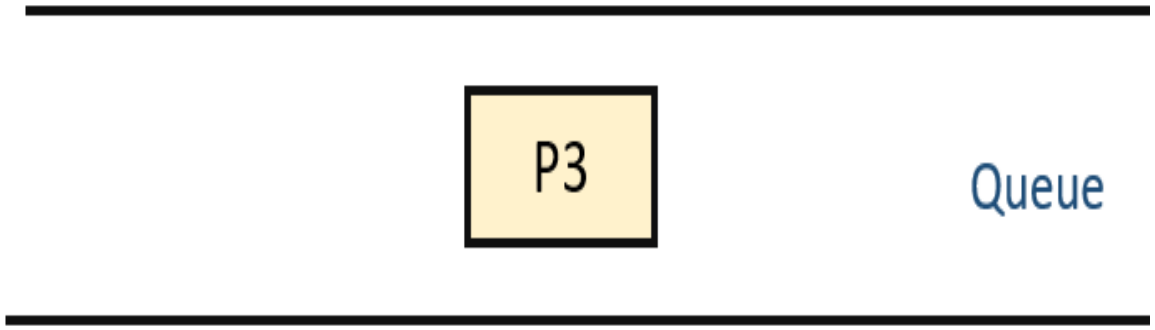
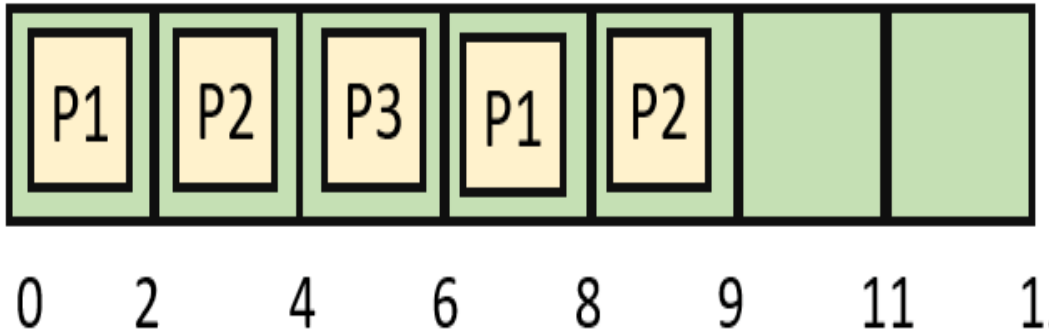
Process Queue	Burst time
P1	4
P2	3
P3	5



Time Slice = 2



Step 6) P2 has a burst time of 3. It has already executed for 2 interval. At time=9, P2 completes execution. Then, P3 starts execution till it completes.

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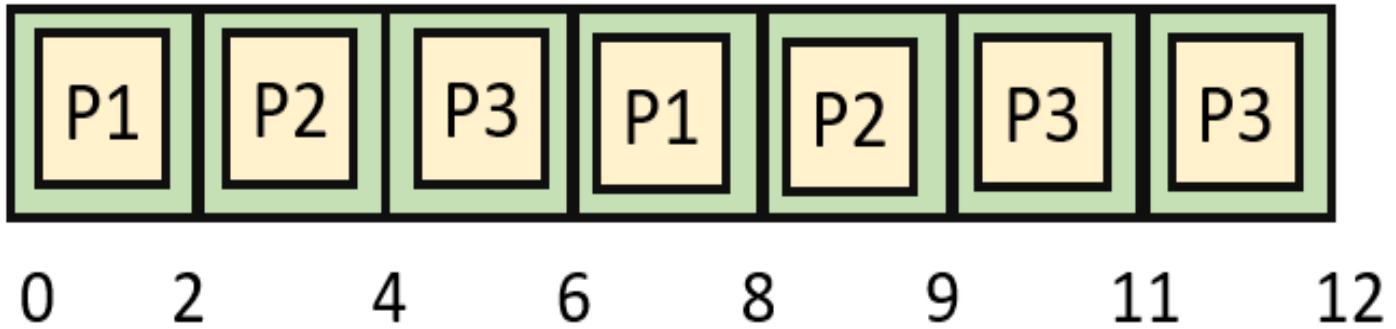
Process Queue	Burst time
P1	4
P2	3
P3	5

Time Slice = 2



Step 7) Let's calculate the average waiting time for above example.

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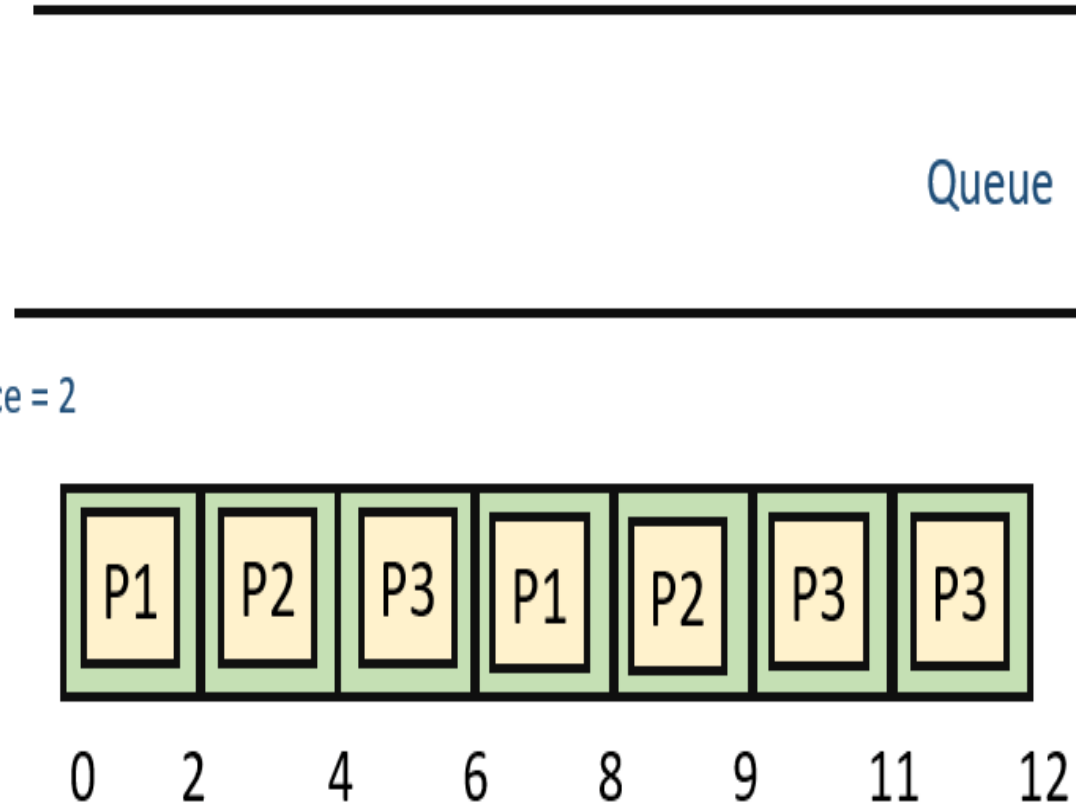
- **Wait time**
  - P1= 0+ 4= 4
  - P2= 2+4= 6
  - P3= 4+3= 7
- **Average Waiting Time**
  - =(4+6+7)/3
  - = 17/3
  - =5.6



Advantage and Disadvantages of Round-robin Scheduling

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Advantages

1. It can be actually implementable in the system *because it is not depending on the burst time.*
2. It doesn't suffer from the problem *of starvation or convoy effect*.
3. All the jobs get ***a fare allocation of CPU***.

Convoy Effect is **phenomenon associated with the First Come First Serve (FCFS) algorithm, in which the whole Operating System slows down due to few slow processes.**

Disadvantages

1. The higher the time quantum, ***the higher the response time in the system***.
2. The lower the time quantum, ***the higher the context switching overhead in the system.***
3. Deciding a perfect time quantum *is really a very difficult task in the system*.

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Coding Part-1

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```
#include<stdio.h>
void main()
{
    int i,j,n,bu[10],wa[10],tat[10],t,ct[10],max;
    float awt=0,att=0,temp=0;
    printf("Enter the no of processes -- ");
    scanf("%d",&n);
```

Coding Part-2

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```
for(i=0;i<n;i++)
{
    printf("\nEnter Burst Time for process %d -- ", i+1);
    scanf("%d",&bu[i]);
    ct[i]=bu[i];
}

printf("\nEnter the size of time slice -- ");
scanf("%d",&t);
```

Coding Part-3

- max=bu[0];

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- for(i=1;i<n;i++)
  - if(max<bu[i])
    - max=bu[i];

Coding Part-4

```
for(j=0;j<(max/t)+1;j++)
    for(i=0;i<n;i++)
        if(bu[i]!=0)
        {
            if(bu[i]<=t)
            {
                tat[i]=temp+bu[i];
                temp=temp+bu[i];
                bu[i]=0;
            }
            else
            {
                bu[i]=bu[i]-t;
                temp=temp+t;
            }
```

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Coding Part-5

```
for(i=0;i<n;i++)
{
    wa[i] =  tat[i]  -  ct[i];
    att   =  att     +  tat[i];
    awt   =  awt     +  wa[i];
}
```

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Coding Part-6

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```
printf("\nPROCESS\t BURST TIME \t WAITING TIME\tTURNAROUND TIME\n");
for(i=0;i<n;i++)
        printf("%d \t %d \t\t %d \t\t %d \n",i+1,ct[i],wa[i],tat[i]);
printf("\nThe Average Turnaround time is -- %f",att/n);
printf("\nThe Average Waiting time is -- %f ",awt/n);
}
```

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Output

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Enter the no of processes -- 3

Enter Burst Time for process 1 -- 4

Enter Burst Time for process 2 -- 3

Enter Burst Time for process 3 -- 5

Enter the size of time slice -- 2

PROCESS	BURST TIME	WAITING TIME	TURNAROUND TIME
1	4	4	8
2	3	6	9
3	5	7	12

The Average Turnaround time is -- 9.666667
The Average Waiting time is -- 5.666667