Seminar 4. How FCFS Works? Calculating Average Waiting Time

Task. Give an example to FCFS and SJN(or SJF) with explanation and calculation

Here is an example to **FCFS** of five processes arriving at different times. Each process has a different burst time.

Process	Burst time	Arrival time
P1	6	2
P2	3	5
P3	8	1
P4	3	0
P5	4	4

Using the FCFS scheduling algorithm, these processes are handled as follows.

Step 0) The process begins with P4 which has arrival time 0

0	P4

Step 1) At time=1, P3 arrives. P4 is still executing. Hence, P3 is kept in a queue.

Process	Burst time	Arrival time
P1	6	2
P2	3	5
P3	8	1
P4	3	0

| P5 | 4 | 4 |

Step 2) At time= 2, P1 arrives which is kept in the queue.

Process	Burst time	Arrival time
P1	6	2
P2	3	5
P3	8	1
P4	3	0
P5	4	4

Step 3) At time=3, P4 process completes its execution.

Step 4) At time=4, P3, which is first in the queue, starts execution.

Process	Burst time	Arrival time
P1	6	2
P2	3	5
P3	8	1
P4	3	0
P5	4	4
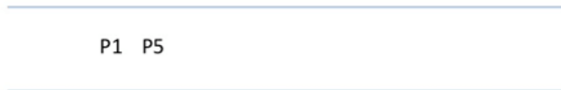
Step 5) At time =5, P2 arrives, and it is kept in a queue.

Process	Burst time	Arrival time
P1	6	2
P2	3	5
P3	8	1
P4	3	0
P5	4	4
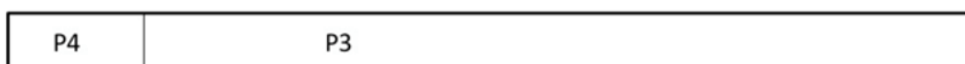
Step 6) At time 11, P3 completes its execution.

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┌──────┐        _____
│  11  │         P1  P5  P2
└──────┘        _____

┌──────────┬────────────────┬─────────────────────┐
│    P4    │       P3       │                     │
└──────────┴────────────────┴─────────────────────┘
```
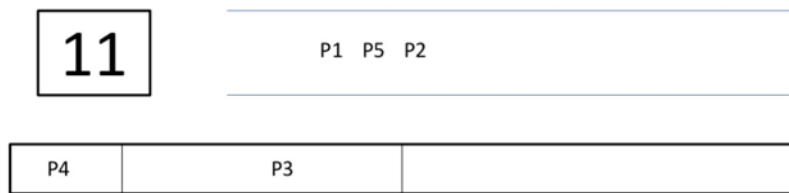
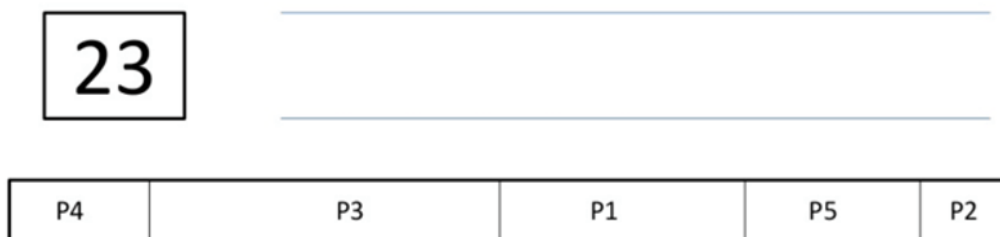**Step 7)** At time=11, P1 starts execution. It has a burst time of 6. It completes execution at time interval 17

```
┌──────┐        _____
│  17  │          P5  P2
└──────┘        _____

┌──────────┬────────────────┬────────────────┬──────────┐
│    P4    │       P3       │       P1       │          │
└──────────┴────────────────┴────────────────┴──────────┘
```
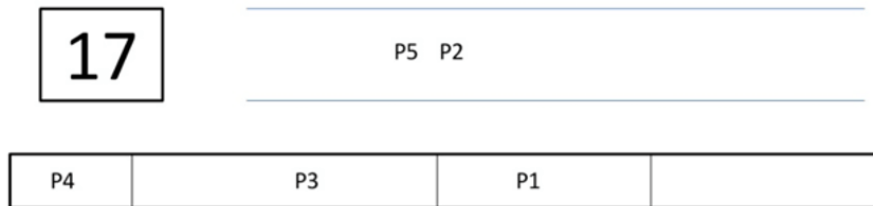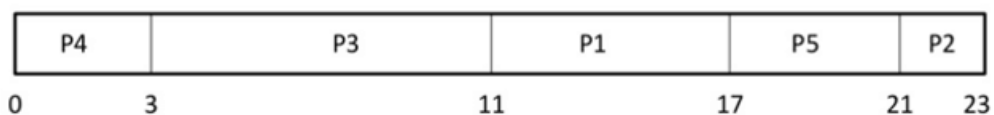
Step 8) At time=17, P5 starts execution. It has a burst time of 4. It completes execution at time=21

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┌──────┐        _____
│  21  │              P2
└──────┘        _____

┌──────────┬────────────────┬────────────────┬────────────────┬──────┐
│    P4    │       P3       │       P1       │       P5       │      │
└──────────┴────────────────┴────────────────┴────────────────┴──────┘
```
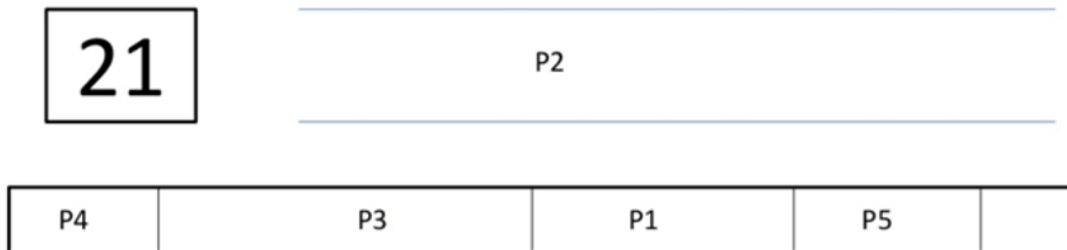
Step 9) At time=21, P2 starts execution. It has a burst time of 2. It completes execution at time interval 23

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┌──────┐        _____
│  23  │
└──────┘        _____

┌──────────┬────────────────┬────────────────┬────────────────┬──────┐
│    P4    │       P3       │       P1       │       P5       │  P2  │
└──────────┴────────────────┴────────────────┴────────────────┴──────┘
```

Step 10) Let's calculate the average waiting time for above example.

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┌──────────┬────────────────┬────────────────┬────────────────┬──────┐
│    P4    │       P3       │       P1       │       P5       │  P2  │
└──────────┴────────────────┴────────────────┴────────────────┴──────┘
0          3               11               17              21    23
```

Waiting time = Start time - Arrival time

P4 = 0-0 = 0

P3 = 3-1 = 2

PI = 11-2 = 9

P5= 17-4 = 13

P2= 21-5= 16

Average Waiting Time

$$\frac{0+2+9+13+16}{5}$$

= 40/5= 8