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CS-501

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ROUND ROBIN (RR) SCHEDULING

RR Scheduling

- Each process gets a small unit of CPU time (*time quantum*), usually 10-100 milliseconds. After this time has elapsed, the process is preempted and added to the end of the ready queue.

- If there are n processes in the ready queue and the time quantum is q, then each process gets 1/n of the CPU time in chunks of at most q time units at once.
  – No process waits more than (n-1)q time units.

RR Question 1

Process	Burst Time
P_1	53
P_2	17
P_3	68
P_4	*24*

Suppose that the processes arrive, at time 0, in the order: P_1 , P_2 , P_3 , *and* P_4. *Time Quantum: 20 unit*

Find:

1. *Waiting Time*
2. *Average Waiting Time*
3. *Turnaround Time*
4. *Average Turnaround Time*

RR Question 1: Solution 1/2

P_1	P_2	P_3	P_4	P_1	P_3	P_4	P_1	P_3	P_3

0 20 37 57 77 97 117 121 134 154 162

Process	Burst Time
P_1	53
P_2	17
P_3	68
P_4	24

- *Waiting Time*
  - *P1wt=0+(77-20)+(121-97)=0+57+24=81 unit time*
  - *P2wt=20 unit time*
  - *P3wt=37+(97-57)+(134-117)=37+40+17=94 unit time*
  - *P4wt=57+(117-77)=57+40=97 unit time*
- *Average Waiting Time*
  - *AWT=(P1wt+P2wt+P3wt+P4wt)/4*
  - *AWT=(81+20+94+97)/4=292/4=73 unit time*

RR Question 1: Solution 2/2

P_1	P_2	P_3	P_4	P_1	P_3	P_4	P_1	P_3	P_3

0 20 37 57 77 97 117 121 134 154 162

Process	Burst Time
P_1	53
P_2	17
P_3	68
P_4	24

- *Turnaround Time*
  - *P1tt=(134-0)=134 unit time*
  - *P2tt=(37-0)=37 unit time*
  - *P3tt=(162-0)=162 unit time*
  - *P4tt=(121-0)=121 unit time*
- *Average Turnaround Time*
  - *ATT=(P1tt+P2tt+P3tt+P4tt)/4*
  - *ATT=(134+37+162+121)/4=454/4=113.5 unit time*

RR Question 2

Process	Burst Time
P_1	24
P_2	3
P_3	3

Suppose that the processes arrive, at time 0, in the order: P_1 , P_2 , P_3 .
Time Quantum: 4 unit.

Find:

1. *Waiting Time*
2. *Average Waiting Time*
3. *Turnaround Time*
4. *Average Turnaround Time*

RR Question 2: Solution 1/2

P_1	P_2	P_3	P_1	P_1	P_1	P_1	P_1

0 4 7 10 14 18 22 26 30

- *Waiting Time*
  - *P1wt=0+(10-4)=6 unit time*
  - *P2wt=4 unit time*
  - *P3wt=7 unit time*

Process	Burst Time
P_1	24
P_2	3
P_3	3

- *Average Waiting Time*
  - *AWT=(P1wt+P2wt+P3wt)/3*
  - *AWT=(6+4+7)/3= 17/3=5.7 unit time*

RR Question 2: Solution 2/2

P_1	P_2	P_3	P_1	P_1	P_1	P_1	P_1

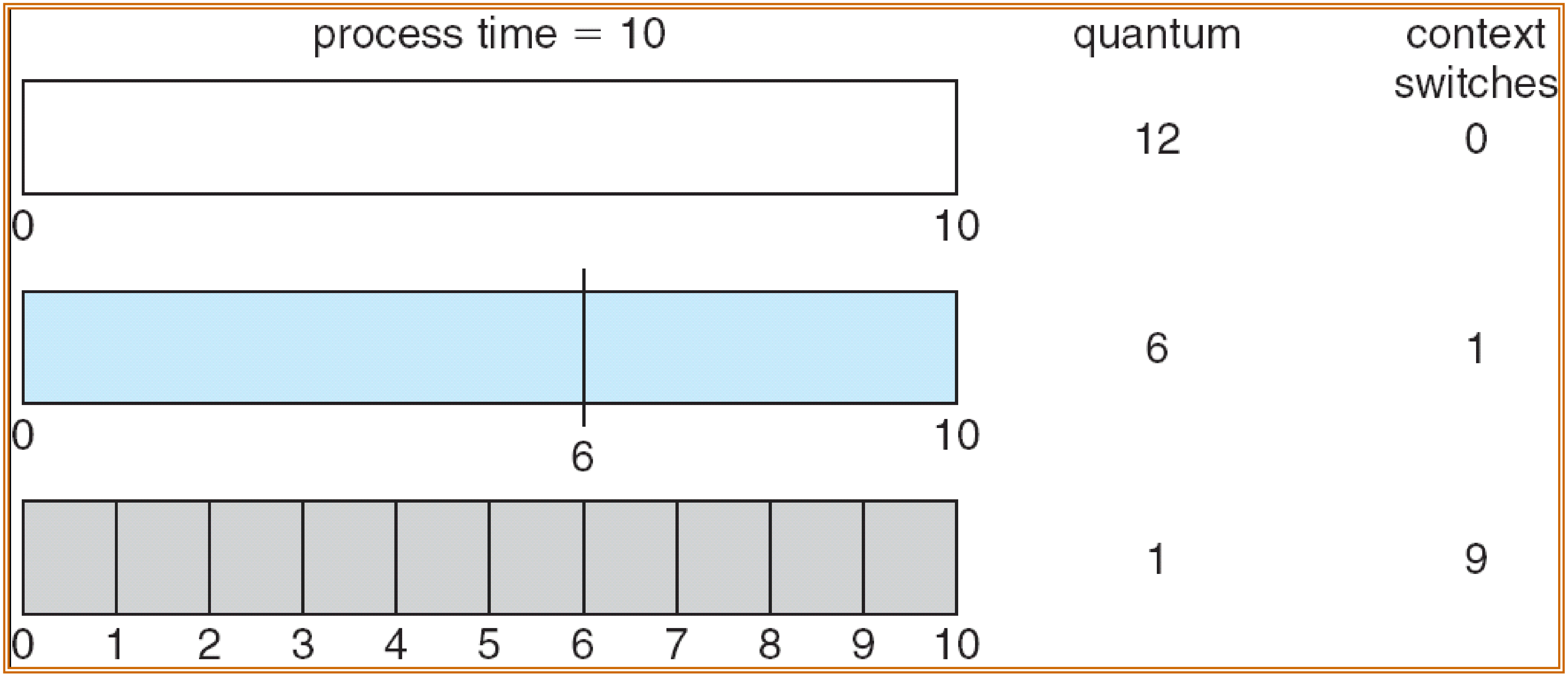
0 4 7 10 14 18 22 26 30

Process	Burst Time
P_1	24
P_2	3
P_3	3

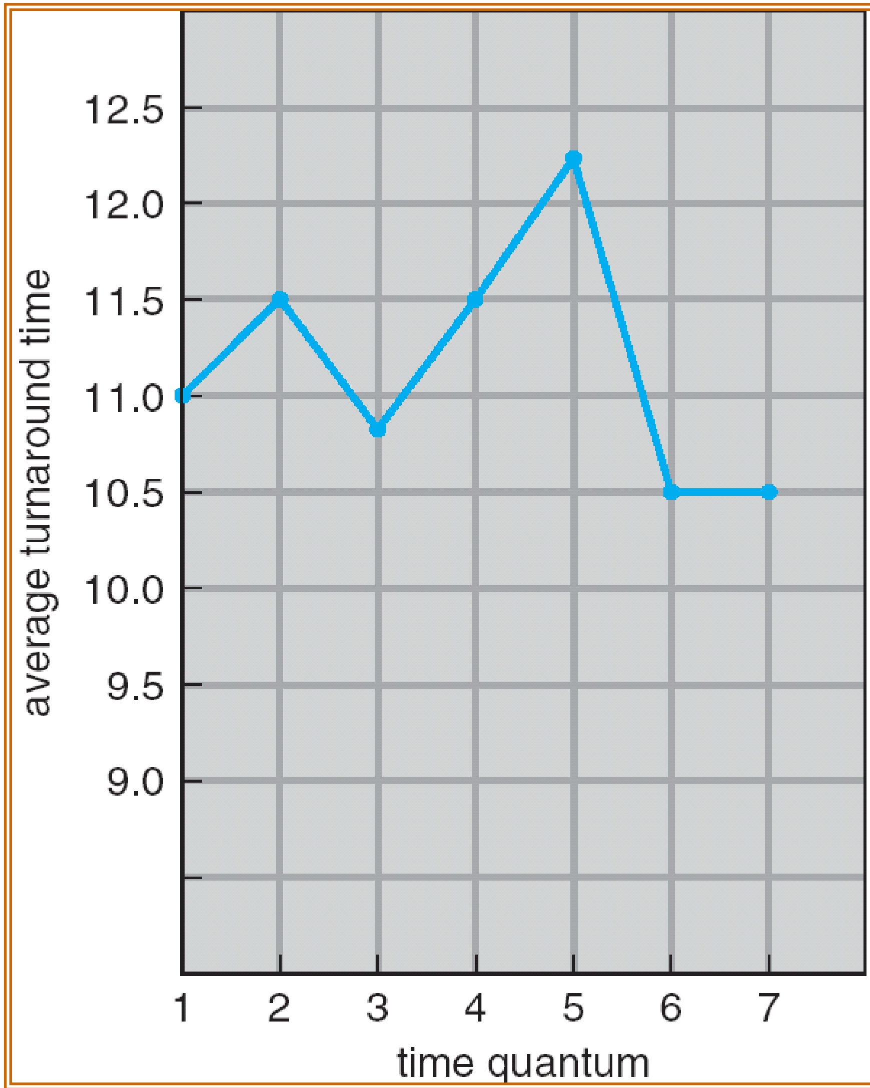
- *Turnaround Time*
  - *P1tt=(30-0)=30 unit time*
  - *P2tt=(7-0)=7 unit time*
  - *P3tt=(10-0)=10 unit time*

- *Average Turnaround Time*
  - *ATT=(P1tt+P2tt+P3tt)/3*
  - *ATT=(30+7+10)/3=47/3=15.7 unit time*

Time Quantum and Context Switch Time



Turnaround Time Varies With The Time Quantum



process	time
P_1	6
P_2	3
P_3	1
P_4	7

RR Scheduling: Analysis

- If the time quantum is too large then the RR scheduling works as
  - **FCFS**
- **Performance issue**
  - q must be large with respect to context switch, otherwise
    - overhead is too high.

References

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley.

2. William Stallings, "Operating Systems: Internals and Design Principles", 6th Edition, Pearson Education.

3. D M Dhamdhere, "Operating Systems: A Concept based Approach", 2nd Edition, TMH.

Thank You.