
OS HW2

— OPERATING SYSTEM 110 FALL —

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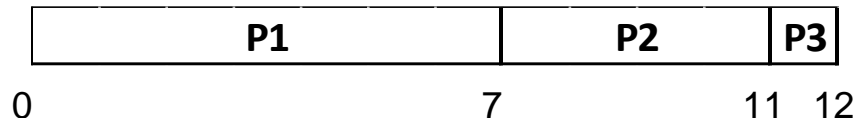
Process Scheduling

1. First-Come, First-Served (FCFS)
2. Shortest-Job-First (SJF)
3. Round-Robin (RR)
4. Multilevel Feedback Queue
Round-Robin (first layer) + Shortest-Remaining-Time-First (second layer)

First-Come, First-Served (FCFS)

Example:

Process	Arrival	CPU burst
1	0	7
2	2	4
3	4	1



Waiting time : $P1 = 0$, $P2 = 5$, $P3 = 7$

Total waiting time : $(0 + 5 + 7) = 12$

Turnaround time : $P1 = 7$, $P2 = 9$, $P3 = 8$

Total turnaround time : $(7 + 9 + 8) = 24$

The format of input file & output

Input file(Q1.txt):

3	First line is the total number of process
0 2 4	Second line is arrival time of each process
7 4 1	Third line is burst Time of each process

Output:

You should output the four things in a text file as the next page

1. Waiting time for each process
2. Turnaround time for each process
3. **Total** waiting time
4. **Total** turnaround time

The format of output file

```
0 7
5 9
7 8
12
24
```

A1.txt

number space number\n

...

number\n

number

```
Process   Waiting Time   Turnaround Time
P[1]      0                7
P[2]      5                9
P[3]      7                8
Total waiting time: 12
Total turnaround time: 24
```

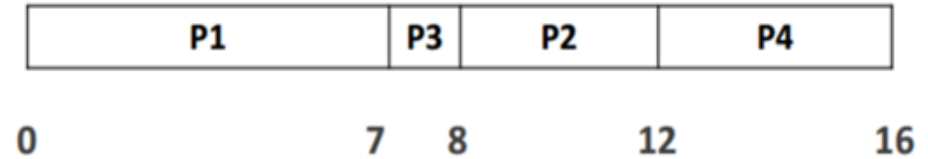
Detail explain

(you just need to print the format as A1.txt)

Shortest-Job-First (SJF)

Example:

Process	Arrival	CPU burst
P1	0	7
P2	2	4
P3	4	1
P4	5	4



Waiting time : P1 = 0, P2 = 6, P3 = 3, P4 = 7

Total waiting time : $(0 + 6 + 3 + 7) = 16$

Turnaround time : P1 = 7, P2 = 10, P3 = 4, P4 = 11

Total turnaround time : $(7 + 10 + 4 + 11) = 32$

The format of input file & output

Input file(Q2.txt):

4	First line is the total number of process
0 2 4 5	Second line is arrival time of each process
7 4 1 4	Third line is burst Time of each process

Output:

You should output the four things in a text file as the next page

1. Waiting time for each process
2. Turnaround time for each process
3. **Total** waiting time
4. **Total** turnaround time

The format of output file

```
0 7
6 10
3 4
7 11
16
32
```

A2.txt

number space number\n

...

number\n

number

```
Process   Waiting Time   Turnaround Time
P[1]      0               7
P[2]      6              10
P[3]      3              4
P[4]      7              11
Total waiting time: 16
Total turnaround time: 32
```

Detail explain

(you just need t print the format as A2.txt)

0

Round-Robin (RR)

Example:

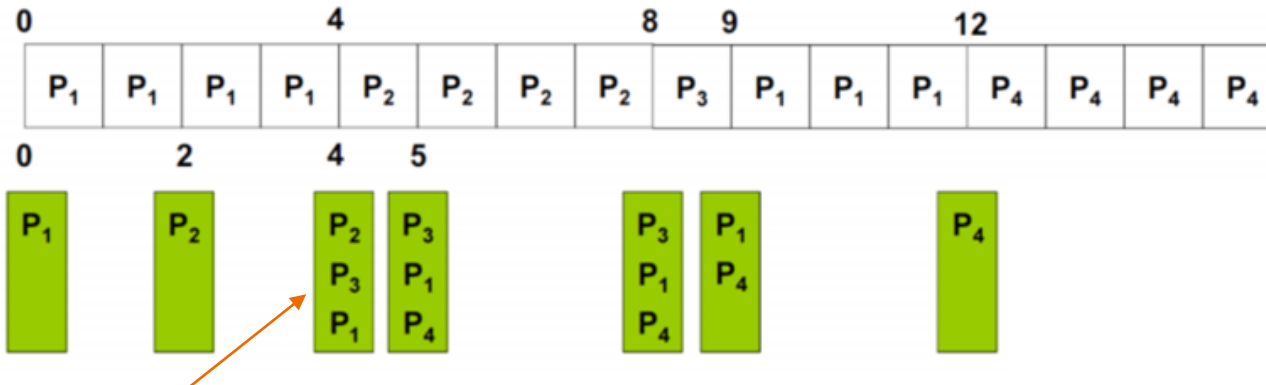
Process	Arrival	CPU burst
P1	0	7
P2	2	4
P3	4	1
P4	5	4

Waiting time : $P1 = 5, P2 = 2, P3 = 4, P4 = 7$

Total waiting time : $(5 + 2 + 4 + 7) = 18$

Turnaround time : $P1 = 12, P2 = 6, P3 = 5, P4 = 11$

Total turnaround time : $(12 + 6 + 5 + 11) = 34$

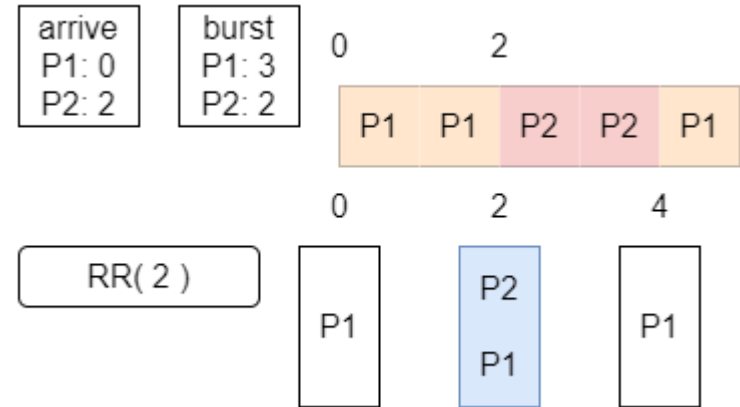


Round-Robin (RR)

Pay attention to this case:

A new process comes while old process just leave CPU because of time quantum.

In this case, CPU will select new process.



The format of input file & output

Input file(Q3.txt):

4	First line is the total number of process
0 2 4 5	Second line is arrival time of each process
7 4 1 4	Third line is burst Time of each process
4	Fourth line is the time quantum

Output:

You should output the four things in a text file as the next page

1. Waiting time for each process
2. Turnaround time for each process
3. **Total** waiting time
4. **Total** turnaround time

The format of output file

```
5 12
2 6
4 5
7 11
18
34
```

A3.txt

number space number\n
...
number\n
number

```
Process   Waiting Time   Turnaround Time
P[1]      5               12
P[2]      2               6
P[3]      4               5
P[4]      7              11
Total waiting time: 18
Total turnaround time: 34
```

Detail explain
(you just need t print the format as A3.txt)

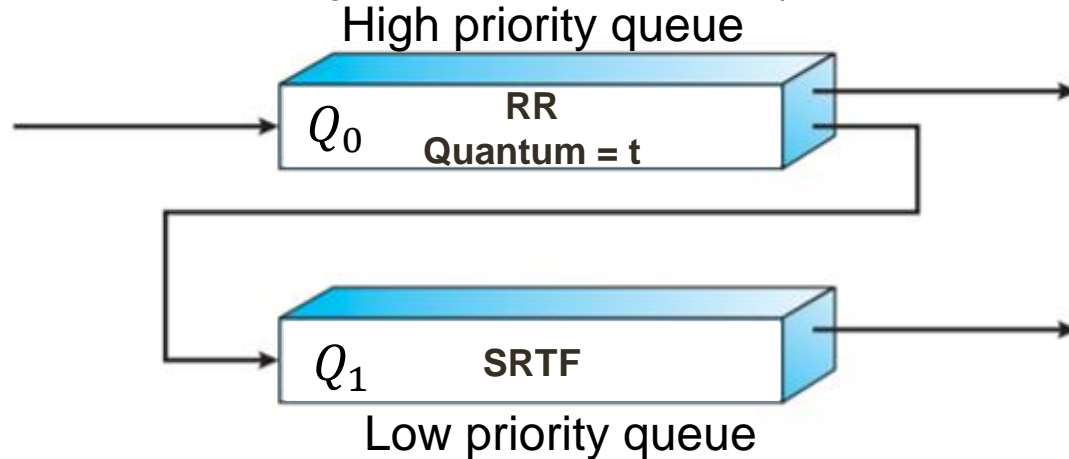
Multilevel Feedback Queue (RR+SRTF)

Processes in lower priority queue is selected if the higher queues are empty.

If a new process comes to higher priority queue, currently executing process in lower priority queue **WILL be preempted** by it.

When a new job comes, it first enters queue Q_0 which is served as RR. As it gains CPU, job receives "t" time unit.

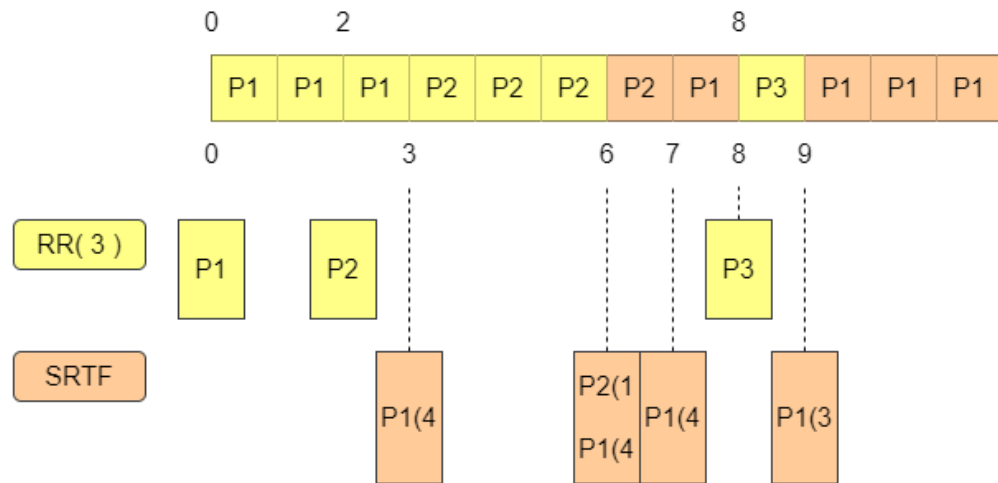
If it doesn't finish in "t" time unit, job is moved to the next queue Q_1 which is served as SRTF.



Multilevel Feedback Queue

Example:

Process	Arrival	CPU burst
1	0	7
2	2	4
3	8	1



Waiting time : P1 = 5, P2 = 1, P3 = 0

Total waiting time : $(5 + 1 + 0) = 6$

Turnaround time : P1 = 12, P2 = 5, P3 = 1

Total turnaround time : $(12 + 5 + 1) = 18$

The format of input file & output

Input file(Q4.txt):

3	First line is the total number of process
0 2 8	Second line is arrival time of each process
7 4 1	Third line is burst Time of each process
3	Fourth line is the time quantum for RR

Output:

You should output the four things in a text file as the next page

1. Waiting time for each process
2. Turnaround time for each process
3. **Total** waiting time
4. **Total** turnaround time

The format of output file

```
5 12
1 5
0 1
6
18
```

A4.txt

number space number\n

...

number\n

number

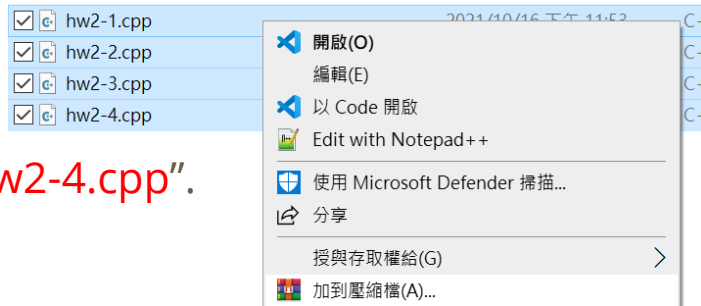
```
Process Waiting Time      Turnaround Time
P[1]      5              12
P[2]      1              5
P[3]      0              1
Total waiting time: 6
Total turnaround time: 18
```

Detail explain

(you just need t print the format as A4.txt)

Requirements

1. You should write codes in **c/c++**.
2. Put all *.cpp source files and report(*.pdf) into same compressed file. The type of compressed file must be **"zip"**.
3. The name of your compressed file must have the form of **"studentID_OS_hw2.zip"** and **without folder**.
4. The name of .cpp file must in the form of **"hw2-1.cpp"** & **"hw2-2.cpp"** & **"hw2-3.cpp"** & **"hw2-4.cpp"**.



Requirements

5. Report: format is in `OS_HW2_report.docx`.
And please `export to PDF` file(`OS_HW2_report.pdf`) before submitting.
6. We will use `"g++ -o hw2-1 hw2-1.cpp"` to compile.

Note : You can use `"./hw2-1 < Q1.txt > myA1.txt"` to test, and compare it to `A1.txt`.

Grade

Total score: 100pts. **COPY WILL GET 0 POINT!**

- HW2-1, 2, 3, 4: 20 pts for each question
(one hidden test case)
`printf("0 7\n5 9\n7 8\n12\n24");` will still get 0 pts
- Report: 20 pts
- Incorrect file form: -20 pts
(Including the names of compressed file, .cpp files, report file type)
- Deadline: 2021/10/31 (Mon) PM11:55
Late submission will get a **-20% point per day**