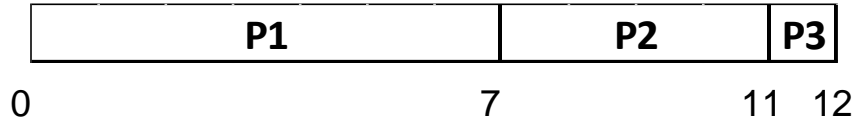

OS HW2

— OPERATING SYSTEM 108 FALL —

Process Scheduling

1. First-Come, First-Served (FCFS)
2. Priority Scheduling (non-preemptive)
3. Priority Scheduling (preemptive)
4. Multilevel Feedback Queue
Round-Robin (first layer) + Priority Scheduling (non-preemptive) (second)

First-Come, First-Served (FCFS)



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
```

```
Question 1
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
```

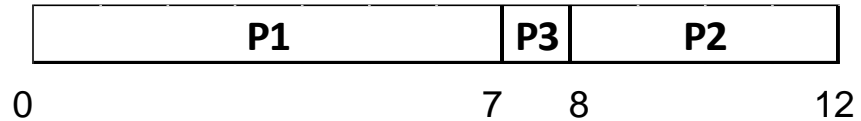
number space number\n

...

number\n

...

Priority Scheduling (non-preemptive)



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

- Waiting time : $P1 = 0$, $P2 = 6$, $P3 = 3$
- Total waiting time : $(0 + 6 + 3) = 9$
- Turnaround time : $P1 = 7$, $P2 = 10$, $P3 = 4$
- Total turnaround time : $(7 + 10 + 4) = 21$

The format of input file & output

❑ Input file(Q2.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
2 3 1	Fourth line is priority 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
9
21
```

Question 2

Process	Waiting Time	Turnaround Time
P[1]	0	7
P[2]	6	10
P[3]	3	4

Total waiting time : 9

Total turnaround time : 21

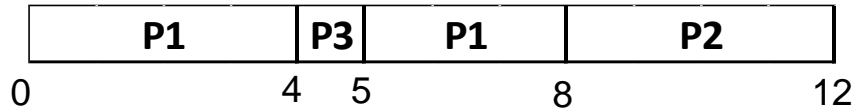
number space number\n

...

number\n

...

Priority Scheduling (preemptive)



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

- Waiting time : $P1 = 1$, $P2 = 6$, $P3 = 0$
- Total waiting time : $(1 + 6 + 0) = 7$
- Turnaround time : $P1 = 8$, $P2 = 10$, $P3 = 1$
- Total turnaround time : $(8 + 10 + 1) = 19$

The format of input file & output

❑ Input file(Q3.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
2 3 1	Fourth line is priority 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

```
1 8
6 10
0 1
7
19
```

```
Question 3
Process    Waiting Time    Turnaround Time
P[1]       1                8
P[2]       6                10
P[3]       0                1

Total waiting time : 7
Total turnaround time : 19
```

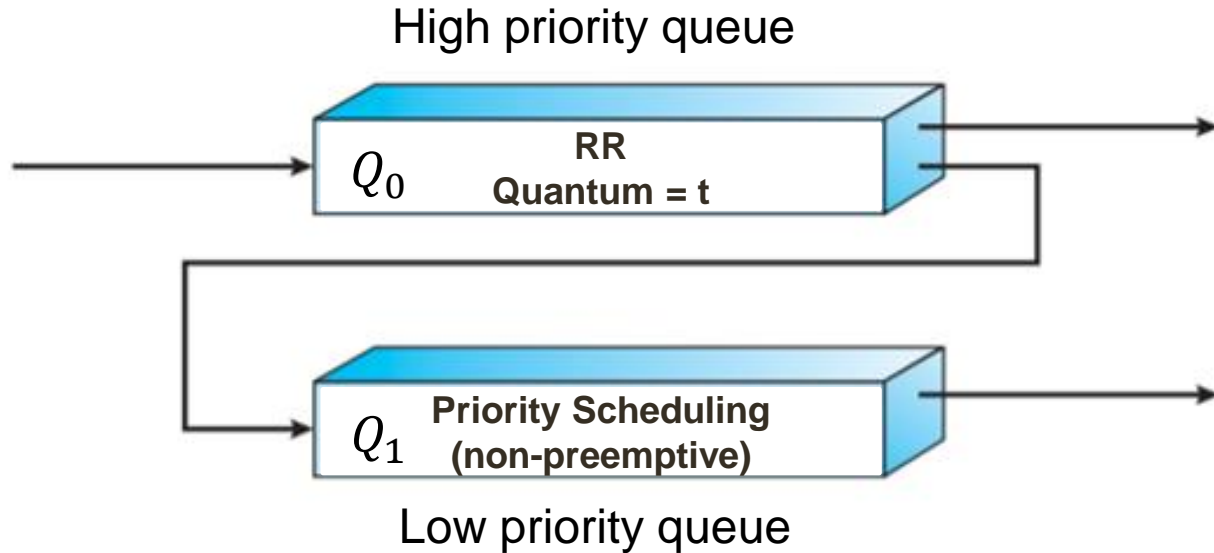
number space number\n

...

number\n

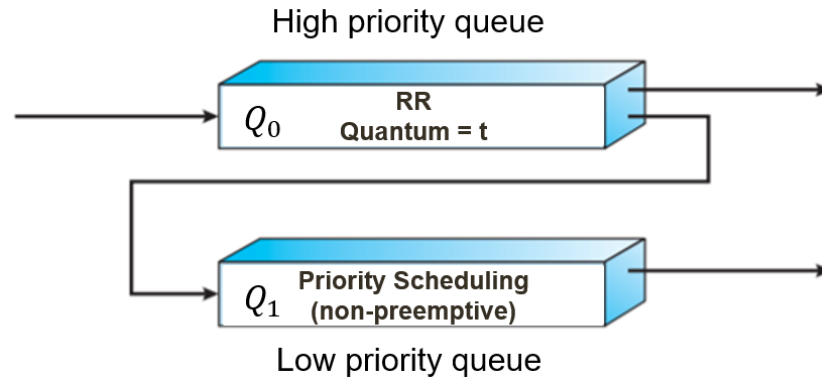
...

Multilevel Feedback Queue

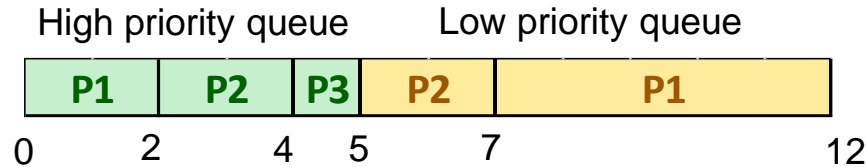


Multilevel Feedback Queue

- The jobs in Q_1 will be served only when Q_0 is empty.
- A new job enters queue Q_0 which is served RR
 - When it gains CPU, job receives t time unit.
 - If it does not finish in t time unit, job is moved to the queue Q_1



Multilevel Feedback Queue



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

- $RR(t) = 2$
- 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 4	Second line is arrival time of each process
7 4 1	Third line is burst Time of each process
3 2 1	Fourth line is priority of each process
2	Fifth line is burst 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
```

```
Question 4
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
```

number space number \n

...

number \n

...

Requirements

1. You should write codes in `c/c++`
2. Put all of *.cpp source files and report 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 `"studentID_hw2-1.cpp"` & `"studentID_hw2-2.cpp"` & `"studentID_hw2-3.cpp"` & `"studentID_hw2-4.cpp"`
5. Report: format is in `OS_HW2_report.pdf`. YOU NEED TO FINISH EVERY PART OF REPORT TO GET SCORE!

Requirements

6. I will using "g++ -o studentID_hw2-1 studentID_hw2-1.cpp" to compile
7. Please confirm g++ compile without warning. If result is wrong and g++ has warning, that question will get 0 point.
 - (g++ **-Wall** -o studentID_hw2-1 studentID_hw2-1.cpp)

Note : Can using "./studentID_hw2-1 < Q1.txt > A1.txt" for test

Grade

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

- HW2-1: 20pts
- HW2-2: 20pts
- HW2-3: 20pts
- HW2-4: 20pts
- Report: 20pts
- Incorrect file form: **-20 pts**
(Including the names of compressed file, .cpp file)
- Deadline: 2019/10/31 (THU) PM11:59. Late submission will get **0 pts**