OS HW2

OPERATING SYSTEM 106 FALL

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Process Scheduling

1. First-Come, First-Served (FCFS)
2. Shortest-Job-First (SJF)
3. Shortest-Remaining-Time-First (SRTF)
4. Multilevel Feedback Queue:

Round-Robin(first layer) + Round-Robin (second layer) + Shortest-Job-First (third layer)

Question 2-1

FIRST-COME, FIRST-SERVED(FCFS)

First-Come, First-Served (FCFS)

Suppose that the processes arrive in the order:P1->P2->P3

Gantt Chart:

Waiting time : P1 = 0 ; P2 = 24 ; P3 = 27

Average waiting time: (0 + 24 + 27)/3 = 17

Turnaround time : P1 = 24 ; P2 = 27 ; P3 = 30

Average Turnaround time : (24 + 27 + 30)/3 = 27

Process	Burst Time
P_1	24
P_2	3
P_3	3

The format of input file & output

- Input file(Q1.txt):

  3 First line is the total number of process

  24 3 3 Second line is burst Time of each process

- Output :

  You should output the four things below on monitor as the right picture

  1. Waiting time for all process
  2. Turnaround time for all process
  3. Average waiting time
  4. Average turnaround time

Process	Waiting Time	Turnaround Time
P[1]	0	24
P[2]	24	27
P[3]	27	30

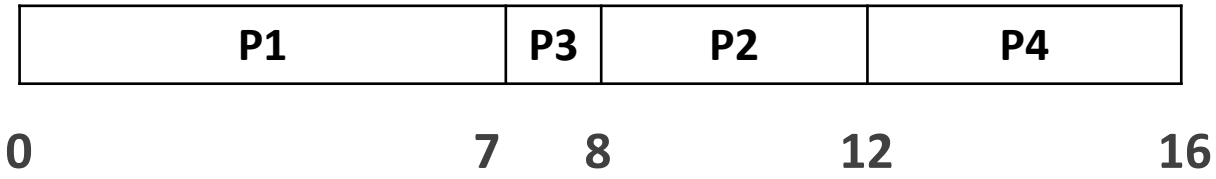
Average waiting time : 17.0000000
Average turnaround time : 27.000000

Question 2-2

SHORTEST-JOB-FIRST(SJF)

Shortest-Job-First (SJF)

Gantt Chart:



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

Average waiting time = (0 + 6 + 3 + 7)/4 = 4

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

Average Turnaround time : (7 + 10 + 4 + 11)/4 = 8

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

- If two processes have the same arrival time and burst time, then the process with small ID have higher priority.

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 below on monitor as the right picture

  1. Waiting time for all process
  2. Turnaround time for all process
  3. Average waiting time
  4. Average turnaround time

Process	Waiting Time	Turnaround Time
P[1]	0	7
P[2]	6	10
P[3]	3	4
P[4]	7	11

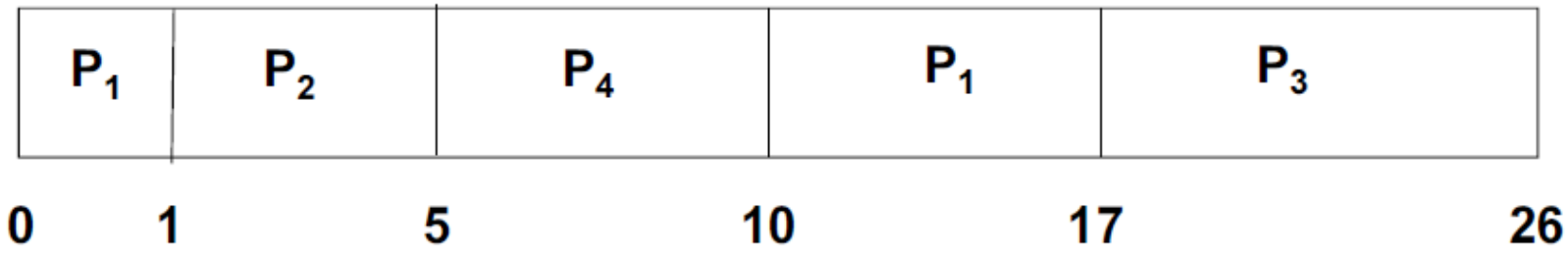
Average waiting time : 4
Average turnaround time : 8

Question 2-3

SHORTEST-REMAINING-TIME-FIRST(SRTF)

Shortest-Remaining-Time-First (SRTF)

Gantt Chart:



Waiting time : P1 = 9 ; P2 = 0 ; P3 = 15 ; P4 = 2

Average waiting time = (9 + 0 + 15 + 2)/4 = 26/4 = 6.5

Turnaround time : P1 = 17 ; P2 = 4 ; P3 = 24 ; P4 =7

Average Turnaround time = (17 + 4 + 24 + 7)/4 = 13

Process	*Arrival* Time	Burst Time
P_1	0	8
P_2	1	4
P_3	2	9
P_4	3	5

- If two processes have the same arrival time and burst time, then the process with small ID have higher priority.

The format of input file & output

- Input file(Q3.txt): :

4	First line is the total number of process
0 1 2 3	Second line is arrival time of each process
8 4 9 5	Third line is burst Time of each process

- Output :

You should output the four things below on monitor as the right picture

1. Waiting time for all process
2. Turnaround time for all process
3. Average waiting time
4. Average turnaround time

Process	Waiting Time	Turnaround Time
P[1]	9	17
P[2]	0	4
P[3]	15	24
P[4]	2	7

Average waiting time : 6.5
Average turnaround time : 13

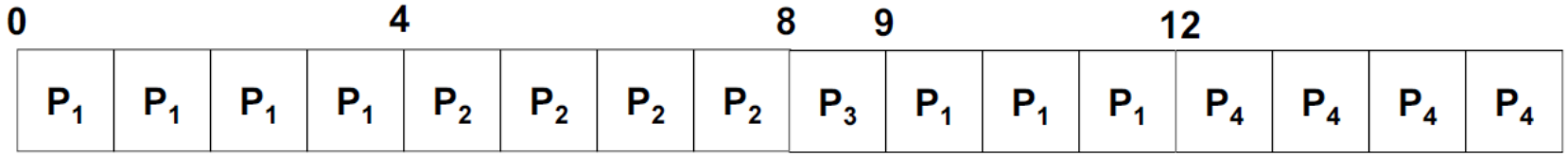
Question 2-4

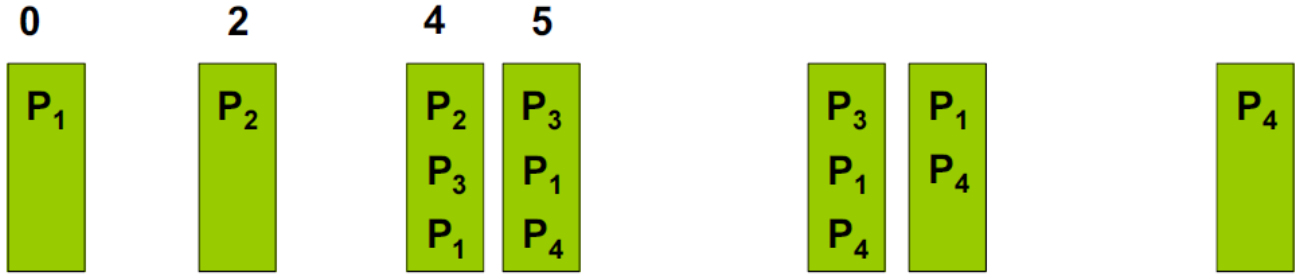
MULTILEVEL FEEDBACK QUEUE: ROUND-ROBIN(FIRST LAYER) + ROUND-ROBIN (SECOND LAYER) + SHORTEST-JOB-FIRST (THIRD LAYER)

Round-Robin(RR)

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

Time quantum (time slice) = 4





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

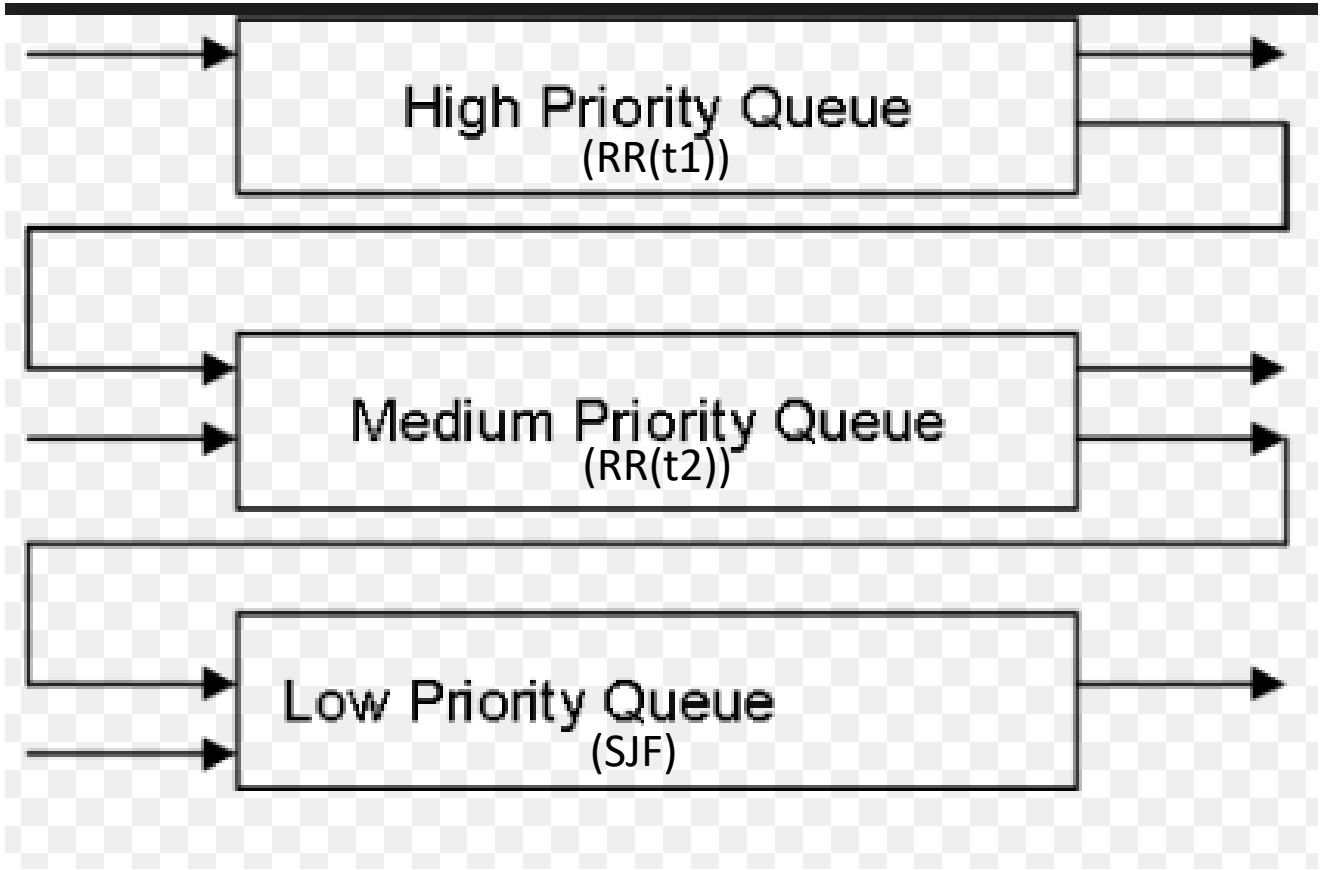
Average waiting time = (5 + 2 + 4 + 7)/4 = 4.5

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

Average Turnaround time = (12 + 6 + 5 + 11)/4 = 8.5

Multilevel Feedback Queue

- Processes in lower priority queue is selected if the higher queues are empty.
- A new job enters high priority queue which is served RR. When it gains CPU, job receives **t1** milliseconds. If it doesn't finish in **t1** milliseconds, job is moved to medium priority queue.
- If high priority queue is empty, processes at medium priority queue is served RR and receives **t2** additional milliseconds. If it still does not complete, it is preempted and moved to low priority queue which is served SJF.

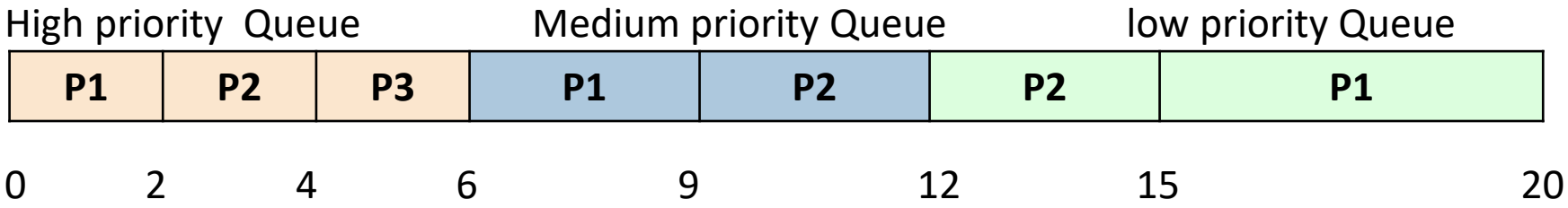


- Suppose there are two processes(P1 & P2) in the second layer.
  If the P3 comes into the first layer , but the P1 in the second layer are still running.
  After finishing P1, go back to first layer to finish all the processes in first layer.
  After first layer are empty, continue run the processes in second layer.

- Suppose there are two processes(P1 & P2) in the third layer.
  If the P3 comes into the first layer , but the P1 in the third layer are still running.
  After finishing P1, go back to first layer to finish all the processes in first layer.
  After first and second layer are empty, continue run the processes in third layer.

Multilevel Feedback Queue

Gantt Chart:



Waiting time : P1 = 10; P2 = 6 ; P3 = 2

Average waiting time = [10 + 6 + 2]/3 = 6

Turnaround time : P1 = 20 ; P2 = 14 ; P3 = 4

Average waiting time = [20 + 14 + 4]/3 = 12.66667

Time quantum
High priority queue(t1) : 2
Medium priority queue(t2) : 3

Process	Arrival Time	Burst Time
P[1]	0	10
P[2]	1	8
P[3]	2	2

Multilevel Feedback Queue

- Input file(Q4.txt):

3	First line is the total number of process
0 1 2	Second line is arrival time of each process
10 8 2	Third line is burst Time of each process
2 3	The fourth line is burst Time quantum for high priority Queue & medium priority Queue

- Output :

  You should output the four things below on monitor as right

  1. Waiting time for all process
  2. Turnaround time for all process
  3. Average waiting time
  4. Average turnaround time

Process	Waiting Time	Turnaround Time
P[1]	10	20
P[2]	6	14
P[3]	2	4

Average waiting time : 6
Average turnaround time : 12.66667

Requirements

1. You should write codes in c++
2. Put all of *.cpp source files into same compressed file. The type of compressed file must be “zip”
3. The name of your compressed file must have the form of “student ID_OS_hw2.zip”
4. The name of .cpp file must in the form of “student ID_hw2-1.cpp” & “student ID_hw2-2.cpp” &“student ID_hw2-3.cpp” &“student ID_hw2-4.cpp”
5. Use NCTU CS Workstation as your programming environment

Grade

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

a. Question 2-1 : 20 pts
b. Question 2-2 : 30 pts
c. Question 2-3 : 30 pts
d. Question 2-4 : 20 pts
e. Incorrect file form(Including the names of compressed file, .cpp file and the output): -10pts
f. Deadline is 2017/11/4 midnight. Late submission will get 0 pts