Round-Robin Scheduling

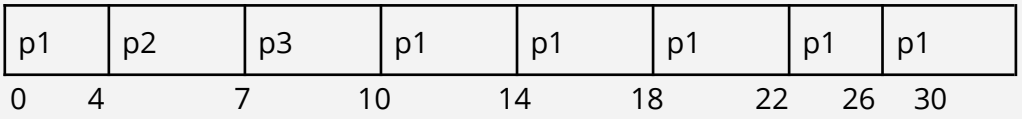
The round-robin (RR) scheduling algorithm is designed especially for time sharing systems. It is similar to FCFS scheduling, but preemption is added to switch between processes. A small unit of time, called a time quantum (or time slice), is defined.
The ready queue is treated as a circular queue.

Example

Process	Burst Time
P1	24
P2	3
P3	3

Time quantum = 4 ms

Gantt chart



The average waiting time is 17/3 = 5.66 milliseconds.
Waiting time for P1 = 26 – 20 = 6
P2 = 4
P3 = 7 (6+4+7 / 3 = 5.66 ms)

The performance of the RR algorithm depends heavily on the size of the time–quantum. If the time-quantum is very large(infinite) then RR policy is the same as FCFS policy. If time quantum is very small, RR approach is called processor sharing and appears to the users as though each of n processes has its own processor running at 1/n the speed of a real processor.

User Problems:

Problem 1:

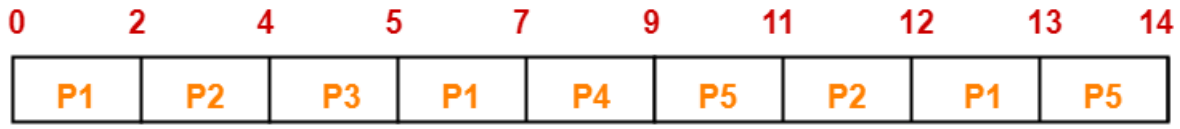
Consider the set of 5 processes whose arrival time and burst time are given below-

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

If the CPU scheduling policy is Round Robin with time quantum = 2 unit, calculate the average waiting time and average turnaround time.

Solution:

Ready Queue-
P5, P1, P2, P5, P4, P1, P3, P2, P1



Gantt Chart

Now, we know-

- Turn Around time = Exit time – Arrival time
- Waiting time = Turnaround time – Burst time

Process Id	Exit time	Turn Around time	Waiting time

P1	13	13 – 0 = 13	13 – 5 = 8
P2	12	12 – 1 = 11	11 – 3 = 8
P3	5	5 – 2 = 3	3 – 1 = 2
P4	9	9 – 3 = 6	6 – 2 = 4
P5	14	14 – 4 = 10	10 – 3 = 7

Now,

- Average Turnaround time = (13 + 11 + 3 + 6 + 10) / 5 = 43 / 5 = 8.6 unit
- Average waiting time = (8 + 8 + 2 + 4 + 7) / 5 = 29 / 5 = 5.8 unit

Problem 2:

Four jobs to be executed on a single processor system arrive at time 0 in the order A, B, C, D. Their burst CPU time requirements are 4, 1, 8, 1 time units respectively. The completion time of A under round robin scheduling with time slice of one time unit is-

1. **10**
2. **4**
3. **8**
4. **9**

Solution:

Process Id	Arrival time	Burst time
A	0	4
B	0	1
C	0	8
D	0	1

Ready Queue-

C, A, C, A, C, A, D, C, B, A

Gantt Chart

Clearly, completion time of process A = 9 unit.
Thus, Option (D) is correct.

Interview Questions

1. Why is the round robin algorithm considered better than the first come first served algorithm? (Vmware)

The first come first served algorithm is the simplest scheduling algorithm known. The processes are assigned to the CPU on the basis of their arrival time in the ready queue. Since, it is non-preemptive once a process is assigned to the CPU, it will run till completion. Since a process takes the CPU till it is executed it is not very good in providing good response times. It can make other important processes wait un-necessarily.

On the other hand, the round robin algorithm works on the concept of time slice or also known as quantum. In this algorithm, every process is given a predefined amount of time to complete the process. In case, a process is not completed in its predefined time then it is assigned to the next process waiting in the queue. In this way, a continuous execution of processes is maintained which would not have been possible in case of FCFS algorithm

2. What is Round Robin Scheduling? (TCS)

Please refer to the notes for definitions of the aforementioned operating systems under the heading “Round Robin Scheduling”.

3. What happens when we use round robin scheduling? (Samsung)

a round-robin editor usually uses time-sharing, giving each task time or quantum (its share of CPU time), and interrupting work if it is not completed at that time. The work is resumed the next time the time is given to perform that process.