National University of Modern Languages

Department of Computer Sciences

Subject: Data Structures and Algorithm	**Instructor:** Zainab Malik
Lab Assignment: 2	**Class:** BSCS 3
Student Roll No:	**Student Name:**
Total Marks: 30	**Obtained Marks:**

Assigned Task:

Q1. Study following process scheduling techniques and suggest appropriate data structures for their implementation along with proper justification/reason. **(CLO-3, Marks 15)**

A program that invoked for execution is known as a process. For execution, process enters a queue first (i.e. READY queue) and from this READY queue, process gets dequeued and utilize CPU for the execution of respective task. Process may have different attributes such as process ID, priority, arrival time, completion time, execution time, wait time and turn around time.

- **Process ID**: Unique identifier that differentiate one process from the other. e.g. p1, p2 and p3 etc.
- **Arrival Time**: Time at which the process arrives in the ready queue.
- **Completion Time**: Time at which process completes its execution.
- **Process Execution Time**: Time a process takes for executing its task.
- **Turn Around Time:** Time difference between completion time and arrival time
- **Process Wait Time/Service Time**: Time a process waits in queue due to the execution of other process in the queue or Time difference between turnaround time and execution time.
- **Priority**: Priority is associated with each process that determines the order of execution in *priority scheduling only*.

  For understanding, different scheduling techniques, consider following set of processes along with the associated priority, arrival and execution time *(provided by the user)*.

Table 1: List of Processes

Process ID	Priority	Arrival Time	Execution Time (milli sec)	Wait Time (milli sec)	Completion Time	Turnaround Time
P0	2	0	5			
P1	0	1	3			
P2	3	2	8			
P3	1	3	6			

1. **First-Come-First-Served Scheduling**

   As name suggests that the process coming first should be served/ or executed first. e.g. there are 4 process P0, P1, P2 and P3. According to the arrival time (mentioned in the table 1), p0 came first, therefore it should be executed first for 5 sec as per its execution time. As it was the first one so, its service time/wait time is 0. P1 came at 1 (arrival time), so, it should be executed at second number for 3 sec as per the execution time provided by the user. As P1 was executed after P0 whose execution time was 5 sec, that means P1 waited for 5sec before it execution. Similarly p3, will be executed at the end therefore, its waiting time should be 5+3+8=16 sec.

Process ID	Priority	Arrival Time	Execution Time (milli sec)	Wait Time (milli sec)	Completion Time	Turnaround Time
P0	2	0	5	0	5	5
P1	0	1	3	5	8	7
P2	3	2	8	8	16	14
P3	1	3	6	16	22	19

2. Shortest-Job-First Scheduling

The process with shortest execution time should be served/ or executed first. From table 1, as per the execution time process should be executed in following sequence: p1, p0, p3 and p2. However, wait time, completion time and turnaround time should be calculated accordingly.

3. Longest-Job-First Scheduling

The process with longest execution time should be served/ or executed first. From table 1, as per the execution time process should be executed in following sequence: p2, p3, p0 and p1. However, wait time, completion time and turnaround time should be calculated accordingly.

4. Priority Scheduling

The process with highest Priority should be processed first/ or executed first. For example from table 1, as per the associated priorities process should be executed in following sequence: p1, p3, p0 and p2. However, wait time, completion time and turnaround time should be calculated accordingly.

5. Round Robin Scheduling

Each process is provided with a fix time to execute, it is called a quantum. Once a process is executed for a given time period, it re-enter the ready queue (if it is incomplete) with reduced execution time and again wait for it turns. The wait time, completion time and turnaround time should be calculated accordingly. (explore more over the internet)

Q2. Demonstrate the working of suggested data structure for each scenario using the following input. For round robin you may consider quantum time as 3 sec. (CLO-2, Marks 25)

Process ID	Priority	Arrival Time	Execution Time (milli sec)	Wait Time (milli sec)	Completion Time	Turnaround Time
P0	2	0	12sec			
P1	0	1	5sec			
P2	3	2	8sec			
P3	1	3	4sec			