Assignment no -03

Title : CPU Scheduling

Problem statement :
Implement the C program for CPU Scheduling Algorithms: Shortest Job First and Round Robin.

Theory :

CPU scheduling is the task of selecting a waiting process from the ready queue and allocating the CPU to it. The CPU is allocated to the selected process by the dispatcher (It is the module that gives control of the CPU to the processes by short-term scheduler). Scheduling is a fundamental operating system function.

In a single processor system, only one process can run at a time; any other process must wait until the CPU is free and can be rescheduled. The objective of multiprogramming is to have some process running at all times, to maximize CPU utilization.

CPU scheduling decisions may take place under the following four circumstances:

1. When a process switches from the running state to the waiting state
2. When a process switches from the running state to the ready state.
3. When a process switches from the waiting state to the ready state.
4. When a process terminates.

Depending on the above circumstances the two types of scheduling are:

1. NON-PREEMPTIVE
2. PREEMPTIVE

1. *NON-PREEMPTIVE*: Under this scheduling, once the CPU has been allocated to a process, the process keeps the CPU until it releases the CPU either by terminating or by switching to the waiting state.
2. *PREEMPTIVE*: Under this scheduling, once the CPU has been allocated to a process, the process does not keep the CPU but can be utilized by some other process. This incurs a cost associated with access to shared data. It also affects the design of the operating system kernel.

SCHEDULING CRITERIA:

1. CPU utilization: It can range from 0-100%.In a real system, it ranges should range from 40-90%.
2. Throughput: Number of processes that are completed per unit time.
3. Turnaround time: How long a process takes to execute. It is the sum of the periods spent waiting to get into memory, waiting in the ready queue, executing on the CPU, and doing I/O
4. Waiting time: It is the sum of the periods spent waiting in the ready queue

5. Response time: Time from the submission of a request until the first response is produced.It is desirable to maximize CPU utilization and Throughput and minimize Turnaround time, waiting time and Response time.

SCHEDULING ALGORITHMS:

1. FCFS
2. SJF
3. PRIORITY
4. ROUND ROBIN

1. FCFS (First-Come, First-Served):

- It is the simplest algorithm and NON-PREEMPTIVE.
- The process that requests the CPU first is allocated the CPU first.
- The implementation is easily managed by queue. When a process enters the ready queue, its PCB is linked onto the tail of the queue. When the CPU is free, it is allocated to the process at the head of the queue
- The average waiting time, however, is long. It is not minimal and may vary substantially if the process's CPU burst time varies greatly.
- This algorithm is particularly troublesome for time-sharing systems.

2. SJF (Shortest Job First):

- This algorithm associates with each process the length of the process's next CPU burst.When the CPU is available, it is assigned to the process that has the smallest next CPUburst. If the next CPU bursts of two processes are same, FCFS is used to break the tie.
- It is also called shortest next CPU burst algorithm or shortest remaining time first scheduling.
- It is provably optimal, in that it gives the minimum average waiting time for a given set of processes.
- The real difficulty with SJF knows the length of the next CPU request.
- It can be either PREEMPTIVE (SRTF- Shortest Remaining Time First) or NON-PREEMPTIVE.

3. PRIORITY SCHEDULING:

- The SJF is a special case of priority scheduling.
- In priority scheduling algorithm, a priority is associated with each process, and the CPU is allocated to the process with the highest priority.
- It can be either PREEMPTIVE or NON-PREEMPTIVE
- A major problem with priority scheduling algorithms is indefinite blocking, or starvation.
- A solution to starvation is AGING. It is a technique of gradually increasing the priority of process that wait in the system for long time.

ROUND ROBIN SCHEDULING :

- It is designed specially for time-sharing systems.
- It is similar to FCFS, but preemption is added to switch between processes.
- A time quantum is defined.
- The CPU scheduler goes around the ready queue, allocating the CPU to each process for a time interval of up to 1 time quantum. If a process's CPU burst exceeds 1 time quantum, that process is preempted and is put back in the ready queue.

Conclusion

Write conclusion in your own words