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Assignment-03

Problem Statement: Implement the C program for CPU Scheduling Algorithms: Shortest Job First (Preemptive) and Round Robin with different arrival time.

Theory:

1. CPU Scheduling

- CPU Scheduling is the process that allows one process to use the CPU while the execution of another process is on hold (in waiting state) due to unavailability of any resource like I/O etc., thereby making full use of CPU.
- The aim of CPU scheduling is to make the system efficient, fast, and fair.
- Whenever the CPU becomes idle, the OS must select one of the processes in the ready queue to be executed.
- The selection process is carried out by the short-term scheduler (or CPU scheduler).
- The scheduler selects from among the processes in memory that are ready to execute and allocates the CPU to one of them.

2. Dispatcher

- A component involved in the CPU scheduling function is the Dispatcher.
- The dispatcher is the module that gives control of the CPU to the short-term scheduler.
- This function involves:
    - Switching context
    - Switching to user mode
    - Jumping to the proper location in the user program to restart that program from where it left last time
- The dispatcher should be as fast as possible, given that it is invoked during every process switch.
- The time taken by the dispatcher to stop one process and start another process is known as the Dispatch Latency.

3. Types of CPU scheduling

- CPU scheduling decisions may take place under one of the following circumstances:
    A. When a process switches from the running state to the waiting state
    B. When a process switches from the running state to the ready state
    C. When a process switched from the waiting state to the ready state
    D. When a process terminates
- In circumstances A and D, there is no choice in terms of scheduling.
- A new process (if present in the ready queue) must be selected for execution
- In such cases the scheduling is said to be non-preemptive
- Under circumstances B and C, the scheduling is said to be preemptive

4. Preemptive scheduling

- The tasks are assigned wit priorities
- At times it is necessary to run a certain task that has a higher priority before another task although it is running.
- Therefore, the running task is interrupted for some time and resumed later when the priority task has finished its execution
- Thus, this type of scheduling is used mainly when a process switches either from running state to ready state or from waiting state to ready state.
- The resources (that is CPU cycles) are mainly allocated to the process for a limited amount of time and then are taken away, and after that, the process is again placed back in the ready queue until it gets the next chance to execute.
- Algorithms based on preemptive scheduling are Shortest Job First (SJF), Round Robin Scheduling (RR), Shortest Remaining Time First (SRTF), etc.

5. Shortest Job First (SJF) Scheduling (Preemptive)

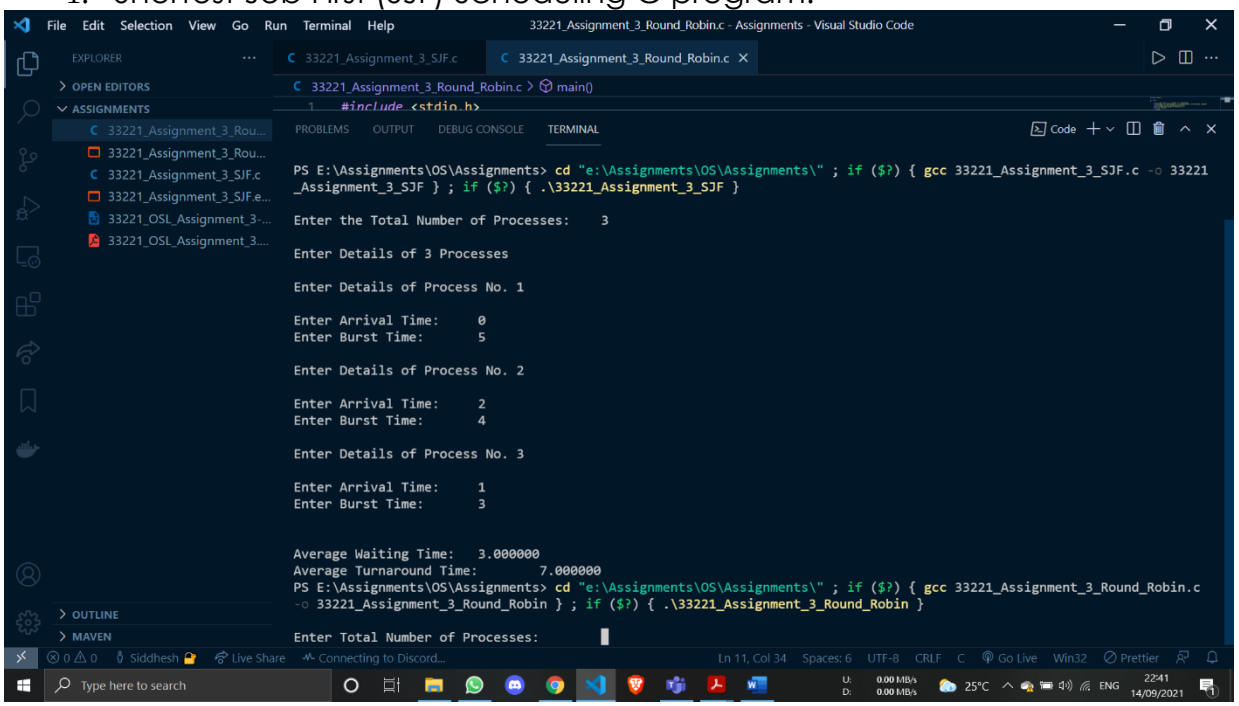
- The SJF scheduling works on the process with the shortest burst time or duration first
- This is the best approach for minimizing the waiting time
- It is used in "Batch Systems"
- To successfully implement it, the burst time/duration time of the processes should be known to the processor in advance, which is practically not feasible all the time
- In Preemptive SJF, jobs are put into ready queue as they arrive, but as a process with short burst time arrives, the existing process is preempted or removed from the execution, and the shorter job is executed first
- The average waiting time for preemptive SJF is less than both, non-preemptive SJF and First Come First Serve (FCFS) scheduling

6. Round Robin (RR) Scheduling

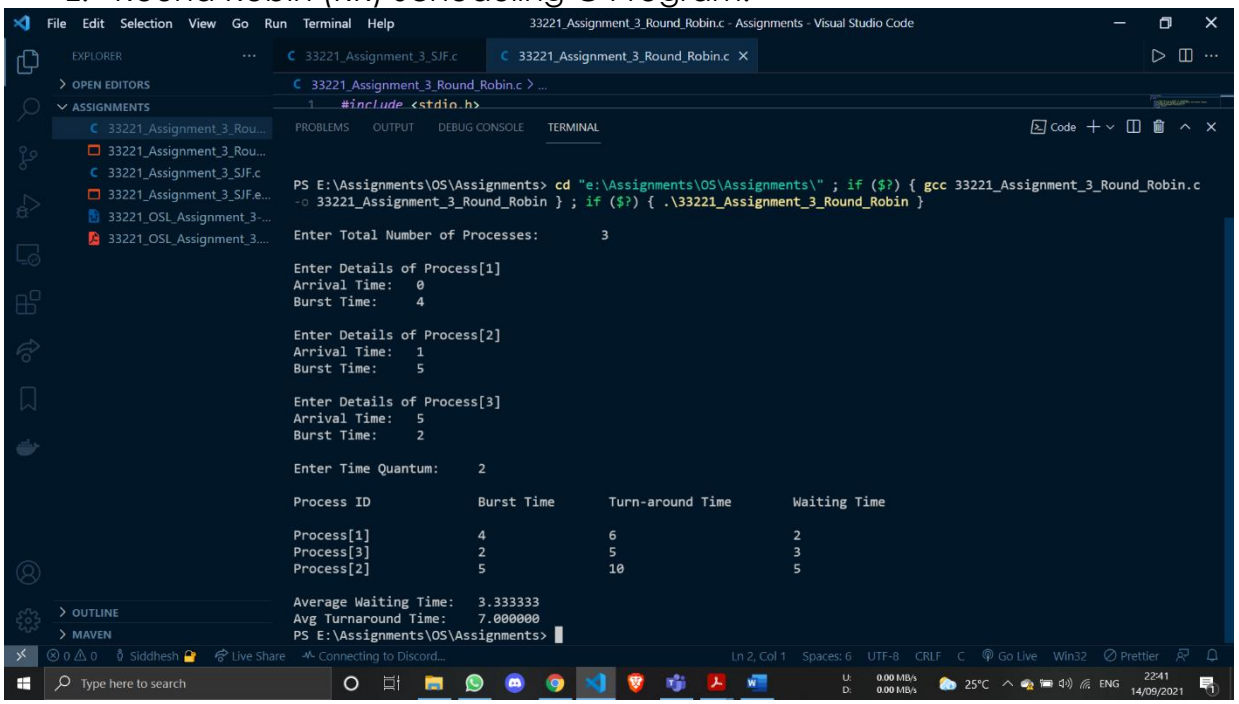
- The RR scheduling algorithm is mainly designed for time-sharing systems.
- This algorithm is similar to FCFS scheduling but in RR scheduling, preemption is added which enables the system to switch between processes
- A fixed time is allocated to each process, called a quantum, for execution
- Once a process is executed for the given time period that process is preempted and another process executes for the given time period.
- Context switching is used to save states of preempted processes
- This algorithm is simple and easy to implement and the most important thing is this algorithm is starvation-free as all processes get a fair share of CPU
- Some characteristics of RR scheduling:
    A. Round Robin Scheduling is a Preemptive Algorithm
    B. It is one of the oldest, easiest and fairest algorithms
    C. It is a real-time algorithm because it responds to the event within a specific time limit.
    D. In this algorithm, the time slice should be minimum that is assigned to a specific task that needs to be processed.
    E. This is a hybrid model and is clock-driven in nature
    F. It is a widely used scheduling method in the traditional OS.

Output:

1. Shortest Job First (SJF) Scheduling C program:



2. Round Robin (RR) Scheduling C Program:



Conclusion:

- In this assignment we have successfully executed CPU scheduling programs
- We have studied about concepts related to CPU scheduling and also learned different CPU scheduling algorithms.
