Experiment:8- Construct a C program to simulate Round Robin scheduling algorithm with C.

Aim:

The aim of this program is to simulate the Round Robin (RR) CPU scheduling algorithm. In this algorithm, each process is assigned a fixed time slice (quantum) in which it executes. If a process does not complete within this time slice, it is preempted and moved to the back of the ready queue. This process continues until all processes have been completed.

Procedure:

1. Input:
   - Number of processes.
   - Burst time for each process.
   - Time quantum (fixed time slice).
2. Execution:
   - Execute each process in a cyclic order.
   - After each time slice, if a process is not finished, move it to the back of the queue.
   - If a process finishes within the time quantum, remove it from the ready queue.
3. Waiting Time Calculation:
   - Calculate the waiting time for each process. The waiting time is the total time a process spends in the ready queue.
4. Turnaround Time Calculation:
   - Calculate the turnaround time for each process. Turnaround time is the total time from the arrival of the process to its completion.
5. Output:
   - Output the process ID, burst time, waiting time, and turnaround time for each process.
   - Calculate and display the average waiting time and average turnaround time.

Round Robin Scheduling Algorithm:

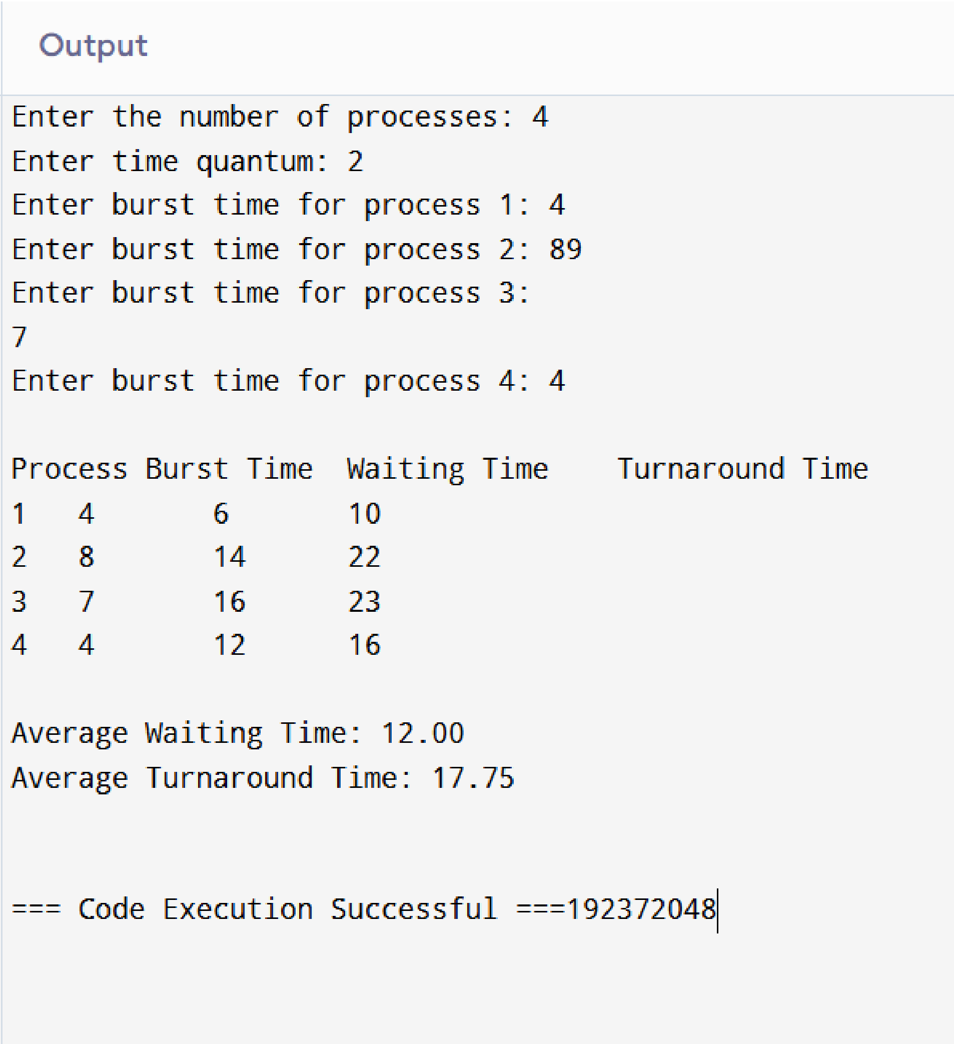
- Round Robin is a preemptive scheduling algorithm where each process is assigned a fixed time slice or time quantum.
- If a process does not finish within its time quantum, it is put back in the ready queue, and the next process is given the CPU.
- This cycle repeats until all processes are completed.

C Program Implementation:

```
#include <stdio.h>
```

```
struct Process {
    int id;
    int burst_time;
    int remaining_time;
    int waiting_time;
    int turnaround_time;
};

void calculateWaitingAndTurnaroundTime(struct Process processes[], int n, int time_quantum) {
    int time = 0;
    int completed = 0;

    // Initially setting remaining times equal to burst times
    for (int i = 0; i < n; i++) {
        processes[i].remaining_time = processes[i].burst_time;
    }

    while (completed < n) {
        for (int i = 0; i < n; i++) {
            if (processes[i].remaining_time > 0) {
                if (processes[i].remaining_time > time_quantum) {
                    // Process will execute for the time quantum
                    processes[i].remaining_time -= time_quantum;
                    time += time_quantum;
                } else {
                    // Process finishes execution
                    time += processes[i].remaining_time;
                    processes[i].waiting_time = time - processes[i].burst_time;
                    processes[i].turnaround_time = time;
                    processes[i].remaining_time = 0;
                    completed++;
                }
            }
        }
    }
}

int main() {
    int n, time_quantum;

    // Input the number of processes and time quantum
    printf("Enter the number of processes: ");
    scanf("%d", &n);
    printf("Enter time quantum: ");
    scanf("%d", &time_quantum);

    struct Process processes[n];

    // Input burst time for each process
    for (int i = 0; i < n; i++) {
        processes[i].id = i + 1;  // Assign process ID
        printf("Enter burst time for process %d: ", i + 1);
        scanf("%d", &processes[i].burst_time);
    }

    // Calculate waiting time and turnaround time
    calculateWaitingAndTurnaroundTime(processes, n, time_quantum);

    // Output the results
    printf("\nProcess\tBurst Time\tWaiting Time\tTurnaround Time\n");
    int total_waiting_time = 0, total_turnaround_time = 0;
    for (int i = 0; i < n; i++) {
        printf("%d\t%d\t\t%d\t\t%d\n", processes[i].id, processes[i].burst_time,
               processes[i].waiting_time, processes[i].turnaround_time);
        total_waiting_time += processes[i].waiting_time;
        total_turnaround_time += processes[i].turnaround_time;
    }

    printf("\nAverage Waiting Time: %.2f\n", (float)total_waiting_time / n);
    printf("Average Turnaround Time: %.2f\n", (float)total_turnaround_time / n);

    return 0;
}
```

Output:



Output

```
Enter the number of processes: 4
Enter time quantum: 2
Enter burst time for process 1: 4
Enter burst time for process 2: 89
Enter burst time for process 3:
7
Enter burst time for process 4: 4

Process Burst Time  Waiting Time    Turnaround Time
1   4       6       10
2   8       14      22
3   7       16      23
4   4       12      16

Average Waiting Time: 12.00
Average Turnaround Time: 17.75


=== Code Execution Successful ===192372048
```

Result:
This is the outcome of the Round Robin Scheduling algorithm with the given burst times and a time quantum of 4 units. The waiting time and turnaround time for each process, as well as their averages, are calculated as shown.