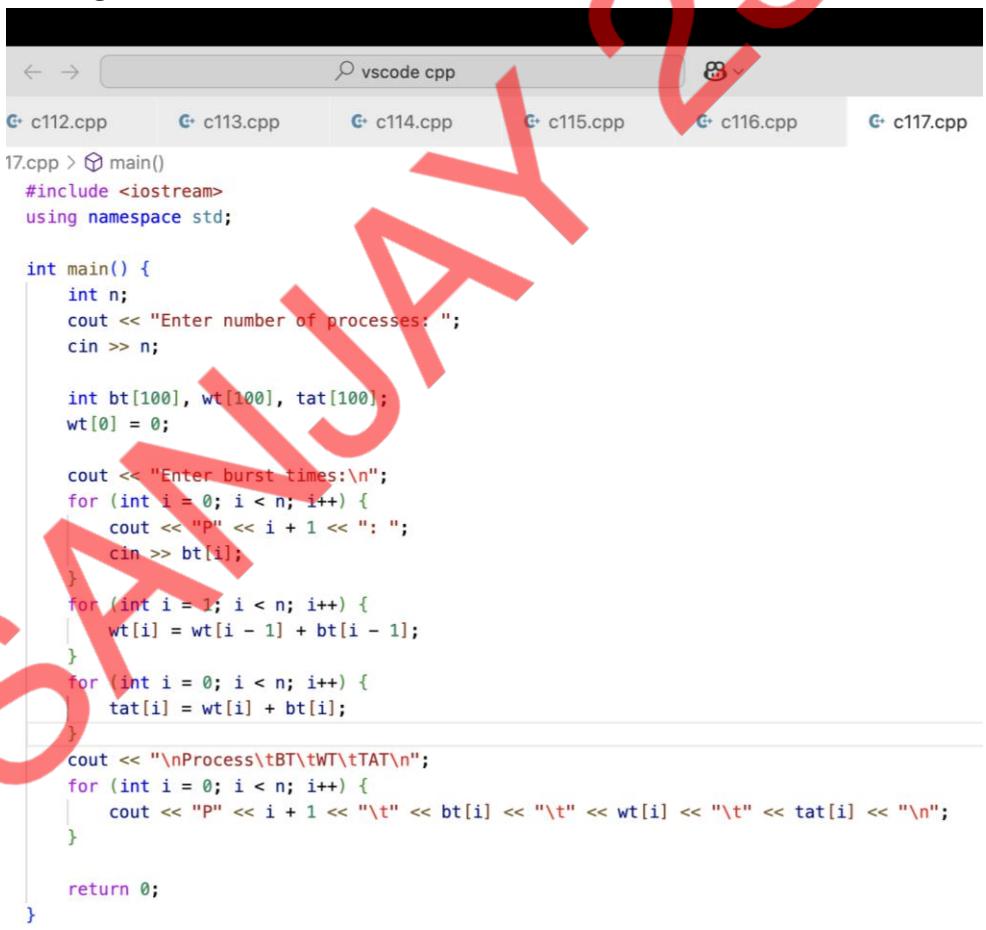
4ITRC2 Operating System Lab

Lab Assignment 5

Create C programs for the different scheduling algorithms.

- Scheduling : **CPU Scheduling** is the process of deciding **which process will use the CPU next** when multiple processes are ready to execute. It is a key function of the operating system that helps in **allocating CPU time efficiently** among all running processes.
  It has many types but we are going to see only three in this document.

1. First Come First Serve (FCFS) : **First Come First Serve (FCFS)** is the simplest type of CPU scheduling algorithm. It executes processes **in the exact order** in which they arrive in the ready queue, similar to a queue at a ticket counter. The process that arrives first gets the CPU first. It is **non-preemptive**, meaning once a process starts executing, it runs till completion without interruption. FCFS is easy to implement but can lead to issues like **convoy effect**, where short jobs wait behind longer ones, increasing average waiting time.




```cpp
#include <iostream>
using namespace std;

int main() {
    int n;
    cout << "Enter number of processes: ";
    cin >> n;

    int bt[100], wt[100], tat[100];
    wt[0] = 0;

    cout << "Enter burst times:\n";
    for (int i = 0; i < n; i++) {
        cout << "P" << i + 1 << ": ";
        cin >> bt[i];
    }
    for (int i = 1; i < n; i++) {
        wt[i] = wt[i - 1] + bt[i - 1];
    }
    for (int i = 0; i < n; i++) {
        tat[i] = wt[i] + bt[i];
    }
    cout << "\nProcess\tBT\tWT\tTAT\n";
    for (int i = 0; i < n; i++) {
        cout << "P" << i + 1 << "\t" << bt[i] << "\t" << wt[i] << "\t" << tat[i] << "\n";
    }

    return 0;
}
```

```
PROBLEMS    OUTPUT    DEBUG CONSOLE    TERMINAL

psingh/Desktop/vscode/vscode cpp/"c117
Enter number of processes: 3
Enter burst times:
P1: 14
P2: 22
P3: 4

Process BT      WT      TAT
P1      14      0       14
P2      22      14      36
P3      4       36      40
mahendrapratapsingh@mahendras-MacBook-Air vscode c
                                                  Ln 22, Col 6
```

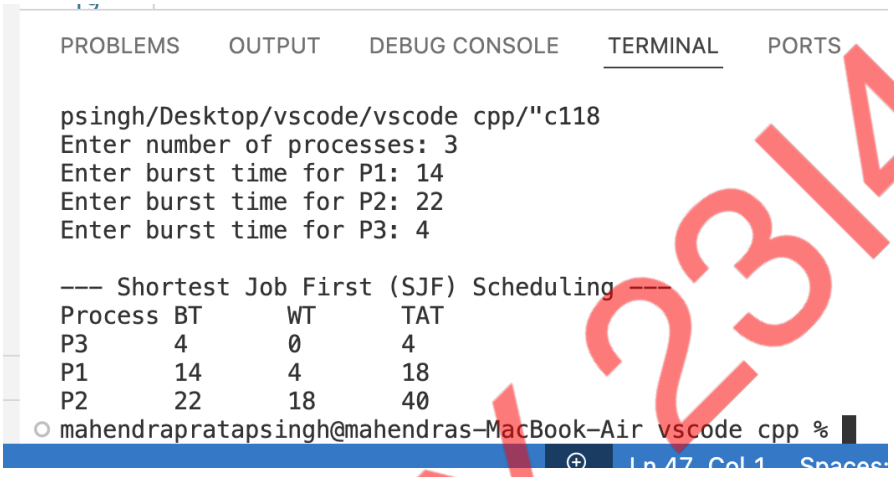
2. Shortest Job First (SJF) : **Shortest Job First (SJF)** scheduling selects the process with the **smallest burst time** (execution time) from the ready queue. It is **non-preemptive**, meaning once the CPU is assigned, the process runs to completion. SJF is optimal in terms of **minimizing average waiting time**, but it requires **prior knowledge** of how long a process will take. If burst time predictions are accurate, this algorithm is very efficient. However, it can cause **starvation** for longer jobs if shorter ones keep arriving.

c118.cpp > ...

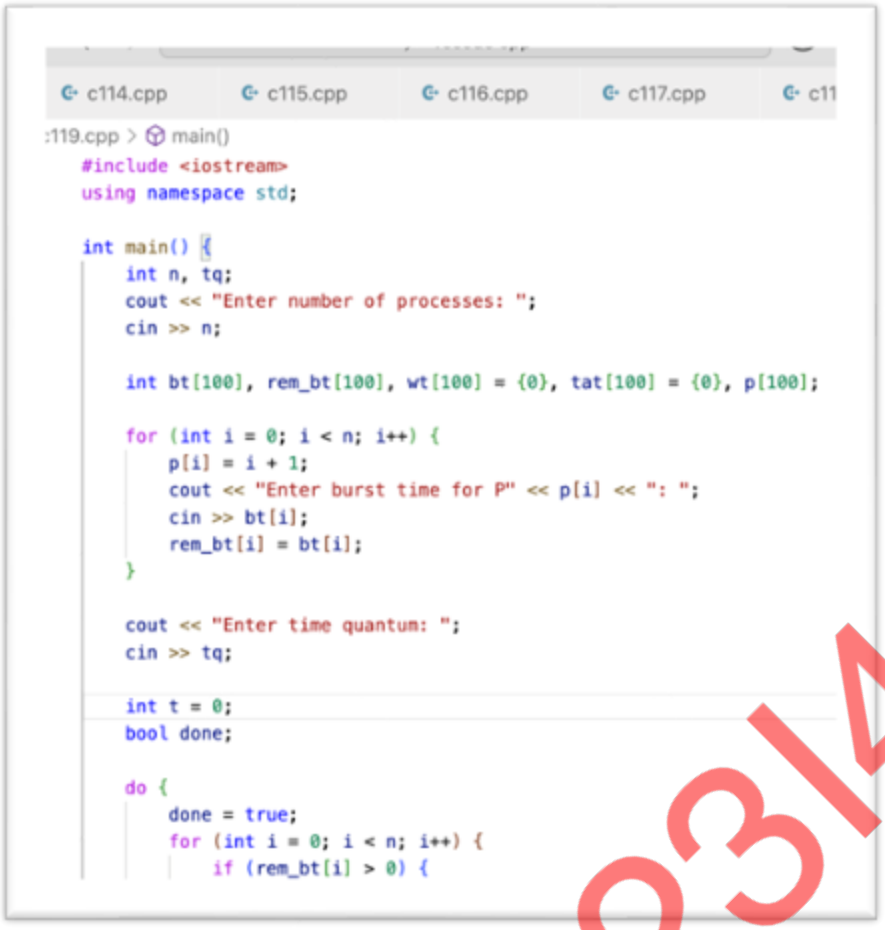
```cpp
#include <iostream>
using namespace std;

void sortByBurstTime(int bt[], int p[], int n) {
    for (int i = 0; i < n - 1; i++) {
        for (int j = i + 1; j < n; j++) {
            if (bt[i] > bt[j]) {
                swap(bt[i], bt[j]);
                swap(p[i], p[j]);
            }
        }
    }
}

int main() {
    int n;
    cout << "Enter number of processes: ";
    cin >> n;

    int bt[100], wt[100], tat[100], p[100];

    for (int i = 0; i < n; i++) {
        p[i] = i + 1;
        cout << "Enter burst time for P" << p[i] << ": ";
        cin >> bt[i];
    }

    sortByBurstTime(bt, p, n);
    wt[0] = 0;

    for (int i = 1; i < n; i++) {
```

Ln 47, Col 1 Spaces: 4 UTF-8 LF {} C++

```
    sortByBurstTime(bt, p, n);
    wt[0] = 0;

    for (int i = 1; i < n; i++) {
        wt[i] = wt[i - 1] + bt[i - 1];
    }

    for (int i = 0; i < n; i++) {
        tat[i] = wt[i] + bt[i];
    }

    cout << "\n--- Shortest Job First (SJF) Scheduling ---\n";
    cout << "Process\tBT\tWT\tTAT\n";
    for (int i = 0; i < n; i++) {
        cout << "P" << p[i] << "\t" << bt[i] << "\t" << wt[i] << "\t" << tat[i] << "\n";
    }

    return 0;
}
```



3. Round Robin Scheduling : **Round Robin Scheduling** is a **preemptive** scheduling algorithm designed for **time-sharing systems**. Each process is assigned a fixed **time quantum** (e.g., 4ms), and the CPU cycles through the processes in the ready queue, giving each one a turn. If a process doesn't finish in its time slice, it is moved to the end of the queue. This ensures **fairness** and prevents any process from monopolizing the CPU. However, if the time quantum is too small, it can lead to **high context switching overhead.**



c114.cpp | c115.cpp | c116.cpp | c117.cpp | c11

:119.cpp > main()

```cpp
#include <iostream>
using namespace std;

int main() {
    int n, tq;
    cout << "Enter number of processes: ";
    cin >> n;

    int bt[100], rem_bt[100], wt[100] = {0}, tat[100] = {0}, p[100];

    for (int i = 0; i < n; i++) {
        p[i] = i + 1;
        cout << "Enter burst time for P" << p[i] << ": ";
        cin >> bt[i];
        rem_bt[i] = bt[i];
    }

    cout << "Enter time quantum: ";
    cin >> tq;

    int t = 0;
    bool done;

    do {
        done = true;
        for (int i = 0; i < n; i++) {
            if (rem_bt[i] > 0) {
```

```cpp
    do {
        done = true;
        for (int i = 0; i < n; i++) {
            if (rem_bt[i] > 0) {
                done = false;
                if (rem_bt[i] > tq) {
                    t += tq;
                    rem_bt[i] -= tq;
                } else {
                    t += rem_bt[i];
                    wt[i] = t - bt[i];
                    rem_bt[i] = 0;
                }
            }
        }
    } while (!done);

    for (int i = 0; i < n; i++) {
        tat[i] = bt[i] + wt[i];
    }

    cout << "\n--- Round Robin Scheduling ---\n";
    cout << "Process\tBT\tWT\tTAT\n";
    for (int i = 0; i < n; i++) {
        cout << "P" << p[i] << "\t" << bt[i] << "\t" << wt[i] << "\t" << tat[i] << "\n";
    }

    return 0;
}
```