Assignment 4

Q1: FCFS (First Come First Serve)

- Write a C/C++ program that:
- Reads the number of processes (Sample input)
- Accepts arrival time and burst time for each process (Sample input)
- Schedules processes using FCFS
- Calculates WT and TAT
- Displays results in tabular form
- Calculate and display Average WT and TAT

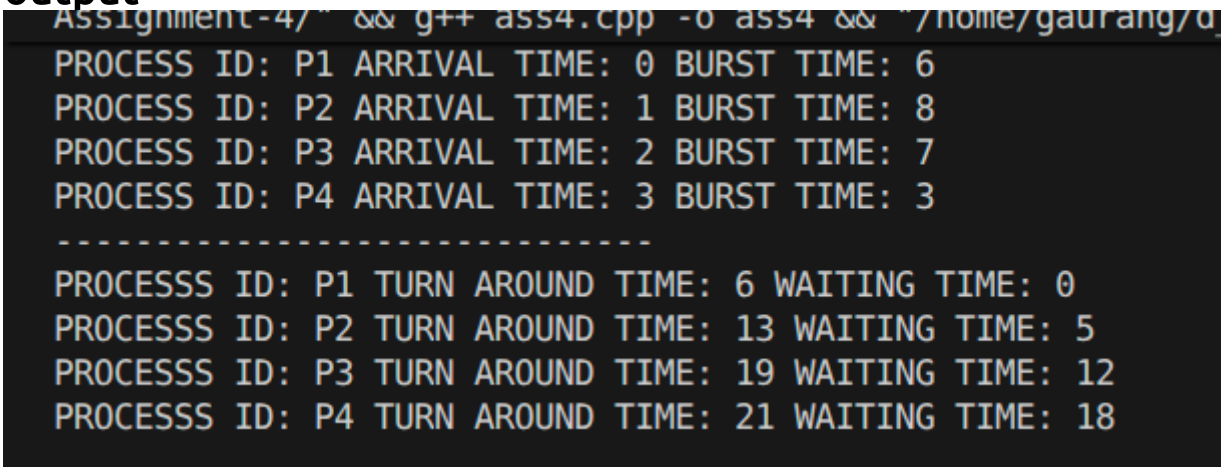
```
#include <iostream>
#include <vector>
#include <sstream>
#include <algorithm>
#include <climits>

struct Times
{
    std::string processsID;
    int arrivalTime = 0;
    int burstTime = 0;
};
struct Report
{
    std::string processId;
    int completionTime = 0;
    int turnAroundTime = 0;
    int waitingTime = 0;
};
class SchedulingAlgorithms
{
private:
    std::vector<Times> info;

public:
    SchedulingAlgorithms(const int &n)
    {
        info.resize(n);

        for (int i = 0; i < n; i++)
        {
            std::string row;
            std::cout << "Enter {processID,arrivalTime,burstTime}: ";
```

```
            std::cin >> row;

            std::stringstream rowStream(row);

            std::string value;

            std::getline(rowStream, value, ',');
            info[i].processsID = value;

            std::getline(rowStream, value, ',');
            info[i].arrivalTime = stoi(value);

            std::getline(rowStream, value, ',');
            info[i].burstTime = stoi(value);
        }
    }
    void fcfs()
    {
        std::sort(info.begin(), info.end(), [](const Times &p1, const Times
&p2)
                  { return p1.arrivalTime < p2.arrivalTime; });
        std::vector<Report> rep(info.size());
        int completionTime = 0;
        for (int i = 0; i < info.size(); i++)
        {
            rep[i].processId = info[i].processsID;
            completionTime += info[i].burstTime;

            rep[i].completionTime = completionTime;
            rep[i].turnAroundTime = rep[i].completionTime -
info[i].arrivalTime;
            rep[i].waitingTime = rep[i].turnAroundTime - info[i].burstTime;
        }
        display();

        std::cout << "------------------------------" << std::endl;
        for (const Report &r : rep)
        {
            std::cout << "PROCESSS ID: " << r.processId << " TURN AROUND
TIME: " << r.turnAroundTime << " WAITING TIME: " << r.waitingTime <<
std::endl;
        }
    }
    void sjf()
    {
        int n = info.size();
        std::vector<Report> rep(n);
        std::vector<bool> completed(n, false);

        int completedCount = 0;
        int currentTime = 0;

        while (completedCount < n)
        {
```

```
            int idx = -1;
            int minBurst = INT_MAX;

            // Find process with smallest burst time among arrived
processes
            for (int i = 0; i < n; i++)
            {
                if (!completed[i] && info[i].arrivalTime <= currentTime)
                {
                    if (info[i].burstTime < minBurst)
                    {
                        minBurst = info[i].burstTime;
                        idx = i;
                    }
                    // Tie breaker: earlier arrival
                    else if (info[i].burstTime == minBurst)
                    {
                        if (info[i].arrivalTime < info[idx].arrivalTime)
                            idx = i;
                    }
                }
            }

            // If no process has arrived yet, move time forward
            if (idx == -1)
            {
                currentTime++;
                continue;
            }

            // Execute selected process
            currentTime += info[idx].burstTime;

            rep[idx].processId = info[idx].processsID;
            rep[idx].completionTime = currentTime;
            rep[idx].turnAroundTime = currentTime - info[idx].arrivalTime;
            rep[idx].waitingTime =
                rep[idx].turnAroundTime - info[idx].burstTime;

            completed[idx] = true;
            completedCount++;
        }

        display();

        std::cout << "------------------------------\n";
        for (const Report &r : rep)
        {
            std::cout << "PROCESS ID: " << r.processId
                      << " TURN AROUND TIME: " << r.turnAroundTime
                      << " WAITING TIME: " << r.waitingTime << std::endl;
        }
    }
```

```
    void display() const
    {
        const size_t infoSize = info.size();
        std::cout << "------------------------------" << std::endl;
        for (int i = 0; i < infoSize; i++)
        {
            std::cout << "PROCESS ID: " << info[i].processsID << " ARRIVAL
TIME: " << info[i].arrivalTime << " BURST TIME: " << info[i].burstTime <<
std::endl;
        }
    }
};

int main()
{
    SchedulingAlgorithms fcfs(4);
    fcfs.fcfs();
    return 0;
}
```

output



Ques2. Q2: SJF (Shortest Job First)

- Write a C/C++ program that:
- Reads the number of processes (Sample input)
- Accepts arrival time and burst time for each process (Sample input)
- Schedules processes using SJF
- Computes WT and TAT
- Displays results in tabular form
- Calculate and display Average WT and TAT

```
#include <iostream>
#include <vector>
```

```
#include <sstream>
#include <algorithm>
#include <climits>

struct Times
{
    std::string processsID;
    int arrivalTime = 0;
    int burstTime = 0;
};
struct Report
{
    std::string processId;
    int completionTime = 0;
    int turnAroundTime = 0;
    int waitingTime = 0;
};
class SchedulingAlgorithms
{
private:
    std::vector<Times> info;

public:
    SchedulingAlgorithms(const int &n)
    {
        info.resize(n);

        for (int i = 0; i < n; i++)
        {
            std::string row;
            std::cout << "Enter {processID,arrivalTime,burstTime}: ";
            std::cin >> row;

            std::stringstream rowStream(row);

            std::string value;

            std::getline(rowStream, value, ',');
            info[i].processsID = value;

            std::getline(rowStream, value, ',');
            info[i].arrivalTime = stoi(value);

            std::getline(rowStream, value, ',');
            info[i].burstTime = stoi(value);
        }
    }
    void fcfs()
    {
        std::sort(info.begin(), info.end(), [](const Times &p1, const Times
&p2)
                  { return p1.arrivalTime < p2.arrivalTime; });
        std::vector<Report> rep(info.size());
        int completionTime = 0;
```

```
        for (int i = 0; i < info.size(); i++)
        {
            rep[i].processId = info[i].processsID;
            completionTime += info[i].burstTime;

            rep[i].completionTime = completionTime;
            rep[i].turnAroundTime = rep[i].completionTime -
info[i].arrivalTime;
            rep[i].waitingTime = rep[i].turnAroundTime - info[i].burstTime;
        }
        display();

        std::cout << "-----------------------------" << std::endl;
        for (const Report &r : rep)
        {
            std::cout << "PROCESSS ID: " << r.processId << " COMPLETION
TIME: " << r.completionTime << " TURN AROUND TIME: " << r.turnAroundTime <<
" WAITING TIME: " << r.waitingTime << std::endl;
        }
    }
    void sjf()
    {
        std::sort(info.begin(), info.end(), [](const Times &p1, const Times
&p2)
                  { return p1.arrivalTime < p2.arrivalTime; });
        int infoSize = info.size();
        std::vector<Report> rep(infoSize);
        std::vector<bool> isComplete(infoSize, false);
        int time = info[0].arrivalTime;
        for (int i = 0; i < infoSize; i++)
        {
            size_t index = i;
            int minBurst = INT_MAX;
            for (int j = 0; j < infoSize; j++)
            {
                if (!isComplete[j] && info[j].arrivalTime <= time &&
info[j].burstTime < minBurst)
                {
                    index = j;
                }
            }
            rep[index].processId = info[index].processsID;
            time += info[index].burstTime;
            rep[index].completionTime = time;
            rep[index].turnAroundTime = rep[index].completionTime -
info[index].arrivalTime;
            rep[index].waitingTime = rep[index].turnAroundTime -
info[index].burstTime;
            isComplete[index] = true;
        }

        display();

        std::cout << "-----------------------------\n";
```

```
        for (const Report &r : rep)
        {
            std::cout << "PROCESSS ID: " << r.processId << " COMPLETION
TIME: " << r.completionTime << " TURN AROUND TIME: " << r.turnAroundTime <<
" WAITING TIME: " << r.waitingTime << std::endl;
        }
    }

    void display() const
    {
        const size_t infoSize = info.size();
        std::cout << "------------------------------" << std::endl;
        for (int i = 0; i < infoSize; i++)
        {
            std::cout << "PROCESS ID: " << info[i].processsID << " ARRIVAL
TIME: " << info[i].arrivalTime << " BURST TIME: " << info[i].burstTime <<
std::endl;
        }
    }
};

int main()
{
    SchedulingAlgorithms fcfs(4);
    fcfs.sjf();
    return 0;
}
```

output

```
------------------------------
PROCESS ID: P1 ARRIVAL TIME: 0 BURST TIME: 6
PROCESS ID: P2 ARRIVAL TIME: 1 BURST TIME: 8
PROCESS ID: P3 ARRIVAL TIME: 2 BURST TIME: 7
PROCESS ID: P4 ARRIVAL TIME: 3 BURST TIME: 3
------------------------------
PROCESSS ID: P1 COMPLETION TIME: 6 TURN AROUND TIME: 6 WAITING TIME: 0
PROCESSS ID: P2 COMPLETION TIME: 24 TURN AROUND TIME: 23 WAITING TIME: 15
PROCESSS ID: P3 COMPLETION TIME: 16 TURN AROUND TIME: 14 WAITING TIME: 7
PROCESSS ID: P4 COMPLETION TIME: 9 TURN AROUND TIME: 6 WAITING TIME: 3
```