```
// Preemtive priority scheduling
// Handled edge cases + idle Time

#include <iostream>
#include <vector>
using namespace std;

struct Process
{
    char Pname[3];
    int prTY;
    int Times[6];
    pair<int, int> scope;
    int b;
};

struct Gantt
{
    int s;
    int e;
    string pname;
};

// ans vector
vector<Process> v;
vector<Gantt> vG;
vector<bool> visited;
int n, CurrTime = 0;
float avgc, avgw, avgt, avgr;

bool allVisited()
{
    // traverse the visited array and find a false, hence return it
    for (auto b : visited)
    {
        if (!b)
            return false;
    }
    return true;
}

void SRTF()
{
    while (!allVisited())
    {

        int min = 1000;
        int idx = -1;
        for (int i = 0; i < v.size(); i++)
        {
            if (v[i].Times[0] <= CurrTime && v[i].b != 0)
            {

                if (v[i].prTY < min)
                {
                    idx = i;
                    min = v[i].prTY;
                }
            }
        }
        if (idx != -1)
        {
            int t = CurrTime;
            v[idx].b--;
            if (v[idx].b == 0)
            {
                visited[idx] = true;
            }
            if (v[idx].scope.first == -1)
            {
                v[idx].scope.first = t;
            }
            v[idx].scope.second = t + 1;

            Gantt g;
            g.s = t;
            g.e = t + 1;
            g.pname = v[idx].Pname;
            vG.push_back(g);
        }
        CurrTime++;
    }
}

void calculateTimes()
{

    float sumc = 0, sumw = 0, sumt = 0, sumr = 0;

    // calculating completion time
    for (auto &p : v)
    {
        p.Times[2] = p.scope.second;
        sumc += p.Times[2];
    }

    // calculating turn around time
    //  CT-AR
    for (auto &p : v)
    {
        p.Times[4] = p.Times[2] - p.Times[0];
        sumt += p.Times[4];
    }

    // calculating waiting time
    //  TAT-BT
    for (auto &p : v)
    {
        p.Times[3] = p.Times[2] - p.Times[0] - p.Times[1];
        sumw += p.Times[3];
    }

    // calculating Response Time
    //  First - AT
    for (auto &p : v)
    {
        p.Times[5] = p.scope.first - p.Times[0];
        sumr += p.Times[5];
    }

    // calculating avg(s) time
    avgc = sumc / n;
    avgw = sumw / n;
    avgt = sumt / n;
    avgr = sumr / n;
}

void display()
{
    cout << "\n\nDisplaying the table :- ";

    cout << "\n\n+--------------+----------+------------+--------------+----
-------------+--------------+-----------------+---------------+";
    cout << "\n| Process name | Priority | Burst Time | Arrival Time |
Completion Time | Waiting Time | TurnAround Time | Response Time |";
```

```
    cout << "\n+--------------+----------+------------+--------------+------
-----------+--------------+-----------------+---------------+";
    // cout<<"\n+--------------+------------+--------------+----------------
-+--------------+-----------------+---------------+";

    for (auto i : v)
    {
        printf("\n|      %s      |    %2d    |    %2d      |      %2d      |
       %2d       |      %2d      |      %2d         |      %2d       |",
i.Pname, i.prTY, i.Times[1], i.Times[0], i.Times[2], i.Times[3], i.Times[4],
i.Times[5]);
        // cout<<"\n+--------------+------------+--------------+------------
-----+--------------+-----------------+---------------+";
        cout << "\n+--------------+----------+------------+--------------+--
---------------+--------------+-----------------+---------------+";
    }

    cout << "\n\n";
    printf("\nAverage Completion time : %.2fms", avgc);
    printf("\nAverage Waiting time : %.2fms", avgw);
    printf("\nAverage TurnAround time : %.2fms", avgt);
    printf("\nAverage Response time : %.2fms", avgr);
}

void PrintGantt()
{
    cout << endl
         << endl
         << "Gantt Chart : " << endl
         << endl;
    cout << "---------------------------------------------------------------
-----------------------------------------------";
    cout << endl;

    vector<int> t;
    // vector<pair<int,int>> indices;
    string prv = "-1";
    for (int i = 0; i < CurrTime; i++)
    {
        string ch = "--";
        for (auto g : vG)
        {
            if (g.s == i)
            {
                ch = g.pname;
                break;
```

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            }
        }

        if (prv != ch)
        {
            cout << "| " << ch << "  ";
            t.push_back(i);
        }
        else
            cout << "    ";
        prv = ch;
    }

    cout << "|" << endl;
    t.push_back(CurrTime);
    cout << "---------------------------------------------------------------
-----------------------------------------------";
    cout << endl;
    int prev = 0;
    for (int i = 0; i < t.size(); i++)
    {
        for (int j = 0; j < (t[i] - prev); j++)
        {
            cout << "    ";
        }
        // cout<<t[i];
        printf("%2d", t[i]);

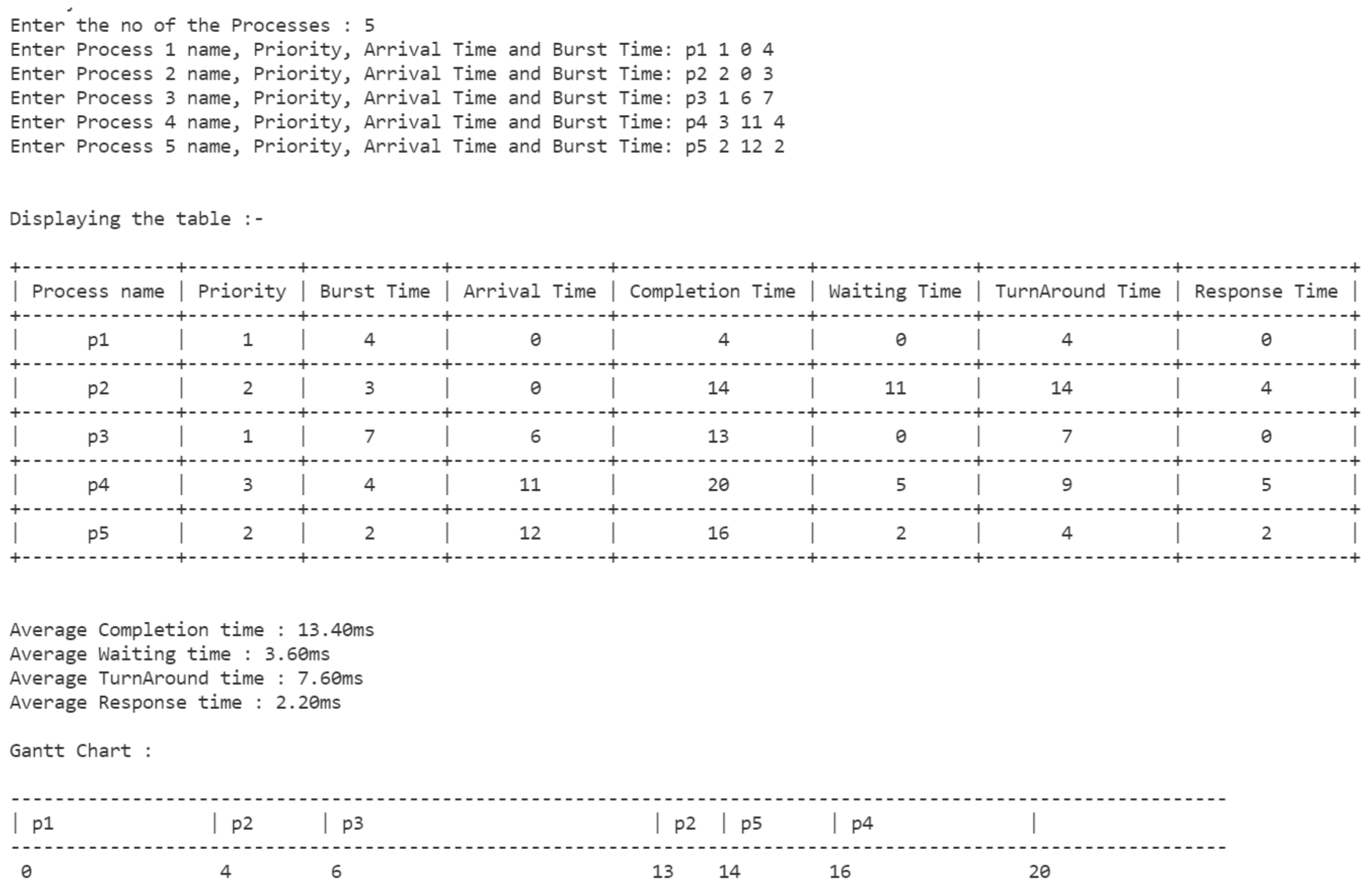
        prev = t[i];
    }
}

int main()
{
    cout << "Enter the no of the Processes : ";
    cin >> n;

    for (int i = 0; i < n; i++)
    {
        struct Process p;
        cout << "Enter Process " << i + 1 << " name, Priority, Arrival Time
and Burst Time: ";
        cin >> p.Pname >> p.prTY >> p.Times[0] >> p.Times[1];
        p.b = p.Times[1];
        visited.push_back(false);
        p.scope.first = -1;
        p.scope.second = -1;
        v.push_back(p);
    }

    SRTF();
    calculateTimes();
    display();
    PrintGantt();
    return 0;
}
```

OUTPUT



```
Enter the no of the Processes : 5
Enter Process 1 name, Priority, Arrival Time and Burst Time: p1 1 0 4
Enter Process 2 name, Priority, Arrival Time and Burst Time: p2 2 0 3
Enter Process 3 name, Priority, Arrival Time and Burst Time: p3 1 6 7
Enter Process 4 name, Priority, Arrival Time and Burst Time: p4 3 11 4
Enter Process 5 name, Priority, Arrival Time and Burst Time: p5 2 12 2


Displaying the table :-

+--------------+----------+------------+--------------+-----------------+--------------+-----------------+---------------+
| Process name | Priority | Burst Time | Arrival Time | Completion Time | Waiting Time | TurnAround Time | Response Time |
+--------------+----------+------------+--------------+-----------------+--------------+-----------------+---------------+
|      p1      |    1     |     4      |      0       |        4        |      0       |        4        |       0       |
+--------------+----------+------------+--------------+-----------------+--------------+-----------------+---------------+
|      p2      |    2     |     3      |      0       |       14        |      11      |       14        |       4       |
+--------------+----------+------------+--------------+-----------------+--------------+-----------------+---------------+
|      p3      |    1     |     7      |      6       |       13        |      0       |        7        |       0       |
+--------------+----------+------------+--------------+-----------------+--------------+-----------------+---------------+
|      p4      |    3     |     4      |      11      |       20        |      5       |        9        |       5       |
+--------------+----------+------------+--------------+-----------------+--------------+-----------------+---------------+
|      p5      |    2     |     2      |      12      |       16        |      2       |        4        |       2       |
+--------------+----------+------------+--------------+-----------------+--------------+-----------------+---------------+


Average Completion time : 13.40ms
Average Waiting time : 3.60ms
Average TurnAround time : 7.60ms
Average Response time : 2.20ms

Gantt Chart :

-------------------------------------------------------------------------------------------------------------
| p1              | p2      | p3                          | p2  | p5      | p4              |
-------------------------------------------------------------------------------------------------------------
 0                 4         6                             13    14        16                20
```

Thank you