Lab No	:	08
Name of the Lab	:	Implementation of SJF Scheduling Algorithm
ID	:	IT-17005

Objectives:

i) What is SJF Scheduling Algorithm?
ii) How to implementation in C?

Answer no (i):

Shortest Job First(SJF):

Shortest Job First scheduling works on the process with the shortest **burst time** or **duration** first.

It is of two types:

1. Non Pre-emptive SJF.
2. Pre-emptive SJF.

1.Non Pre-emptive SJF:

Consider the below processes available in the ready queue for execution, with **arrival time** as 0 for all and given **burst times**.

Process	Burst time
P1	21
P2	3
P3	6
P4	2

In SJF scheduling shortest process is executed first. Hence the GANTT chart will be following:

P4	P2	P3	P1

0 2 5 11 32

Process	A.T	B.T	W.T=(s.t-a.t) + (s.t-l.c.t)	T.A.T=B.T+W.T	C.T
P1	0	21	11	32	32
P2	0	3	2	5	5
P3	0	6	5	11	11
P4	0	2	0	2	2

Average waiting time = $\frac{11+2+5+0}{4}$ = 4.5 ms

Average turn around time = $\frac{32+5+11+2}{4}$ = 12.5 ms

2. Pre-emptive SJF:

In Preemptive Shortest Job First Scheduling, 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 execution, and the shorter job is executed first.

Process	Arrival time	Burst time
P1	0	21
P2	1	3
P3	2	6
P4	3	2

In SJF scheduling shortest process is executed first. Hence the GANTT chart will be following:

P1	P2	P2	P2	P4	P3	P1

0 1 2 3 4 6 12 32

Process	A.T	B.T	W.T=(s.t-a.t) + (s.t-l.c.t)	T.A.T=B.T+W.T	C.T
P1	0	21	11	32	32
P2	1	3	0	3	4
P3	2	6	4	10	12
P4	3	2	1	3	6

Average waiting time = $\frac{11+0+4+1}{4}$ = 4.0 ms

Average turn around time = $\frac{32+3+10+3}{4}$ = 12.0 ms

Answer no (ii):

The implementation of Preemptive SJF scheduling algorithm in C is given below:

Code:

```
// SHORTEST JOB FIRST (Preemptive) Using C++
#include <iostream>
#include <algorithm>
#include <cstring>
using namespace std;

typedef struct proccess
{
    int at,bt,ct,ta,wt,btt;
    string pro_id;

} Schedule;
```

```
bool compare(Schedule a,Schedule b)
{
    return a.at<b.at;

}
bool compare2(Schedule a,Schedule b)
{
    return a.bt<b.bt;
}

int main()
{
    Schedule pro[10];
    int n,i,j,pcom;
    double avg_wt,avg_tat,avg_ct,sum_wt=0,sum_tat=0,sum_ct=0;
    cout<<"Enter the number of Process:";
    cin>>n;

    for(i=0; i<n; i++)
    {
        cout<<"Enter the Process id, arrival time, burst time:";
        cin>>pro[i].pro_id>>pro[i].at>>pro[i].bt;
        pro[i].btt=pro[i].bt;
    }

    sort(pro,pro+n,compare);

    i=0;
    pcom=0;

    while(pcom<n)
    {
        for(j=0; j<n; j++)
        {
            if(pro[j].at>i)
                break;
        }

        sort(pro,pro+j,compare2);
        if(j>0)
        {

            for(j=0; j<n; j++)
            {
                if(pro[j].bt!=0)
                    break;
            }
            if(pro[j].at>i)

            {
                i=pro[j].at;

            }
            pro[j].ct=i+1;
            pro[j].bt--;
        }
        i++;
        pcom=0;
        for(j=0; j<n; j++)
        {
            if(pro[j].bt==0)
                pcom++;
        }
    }

    cout<<"Process\tA.T\tB.T\tW.T\tT.A.T\tC.T\n";

    for(i=0; i<n; i++)
    {
        pro[i].ta=pro[i].ct-pro[i].at;
        pro[i].wt=pro[i].ta-pro[i].btt;

        sum_wt+=pro[i].wt;
        sum_tat+=pro[i].ta;
        sum_ct+=pro[i].ct;

        /*Printing the Process id, arrival time, burst time,
        completion time, turn around time, waiting time*/
```

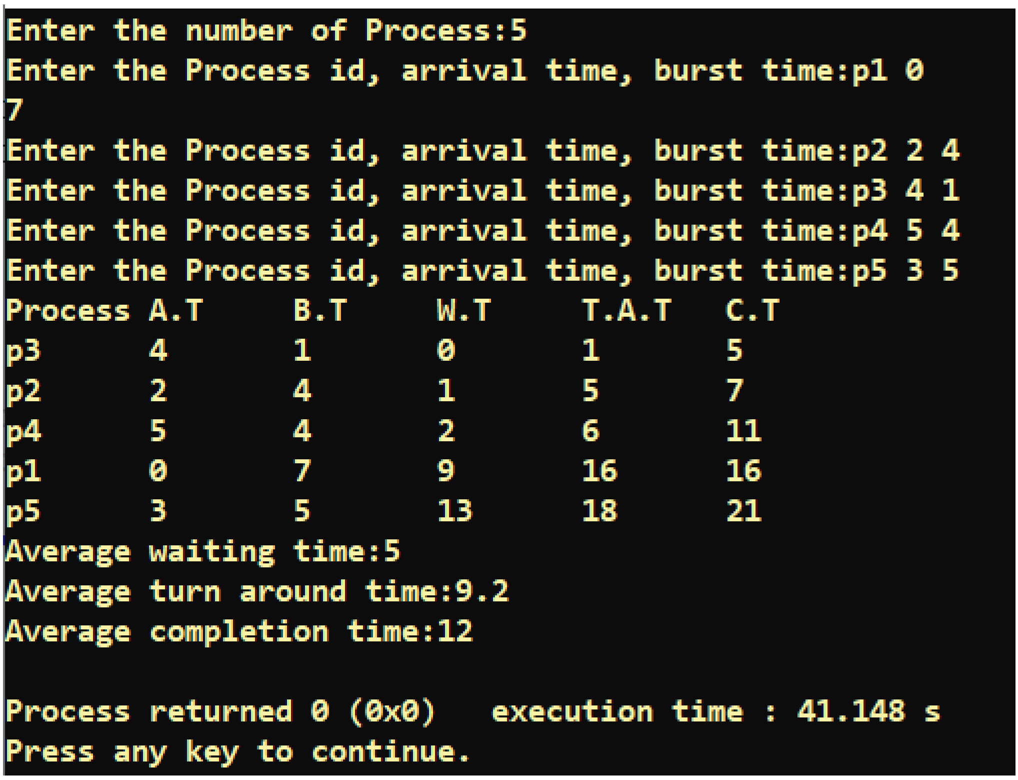
```
cout<<pro[i].pro_id<<"\t"<<pro[i].at<<"\t"<<pro[i].btt<<"\t"<<pro[i].wt<
<"\t"<<pro[i].ta<<"\t"<<pro[i].ct;
        cout<<endl;
    }

    avg_wt=sum_wt/n;
    avg_tat=sum_tat/n;
    avg_ct=sum_ct/n;

    cout<<"Average waiting time:"<<avg_wt<<endl;
    cout<<"Average turn around time:"<<avg_tat<<endl;
    cout<<"Average completion time:"<<avg_ct<<endl;

    return 0;
}
```

Output:



```
Enter the number of Process:5
Enter the Process id, arrival time, burst time:p1 0
7
Enter the Process id, arrival time, burst time:p2 2 4
Enter the Process id, arrival time, burst time:p3 4 1
Enter the Process id, arrival time, burst time:p4 5 4
Enter the Process id, arrival time, burst time:p5 3 5
Process A.T     B.T     W.T     T.A.T   C.T
p3      4       1       0       1       5
p2      2       4       1       5       7
p4      5       4       2       6       11
p1      0       7       9       16      16
p5      3       5       13      18      21
Average waiting time:5
Average turn around time:9.2
Average completion time:12

Process returned 0 (0x0)   execution time : 41.148 s
Press any key to continue.
```