SVKM'S NMIMS Deemed-to-be-University
Mukesh Patel School of Technology Management & Engineering
Department of Computer Engineering

Course Code		Program	B.Tech.
Semester	V	Year	III
Name of the Faculty	Mohini Reddy	Class	
Course Title	Operating Systems	Academic year	2022-23

PART A
(PART A : TO BE REFFERED BY STUDENTS)

Experiment No. 04

A.1—Aim:
Study various Process Scheduling Algorithm and implementation of **Shortest Job First** algorithm and Shortest Remaining Job (SJF with Pre-emption) **A.2--- Prerequisite:**
Concepts of Process & Process Scheduling

A.3--- Outcome:
After successful completion of this experiment students will be able to:
1. Understand the basics of Process & Process Scheduling.
2. Implement SJF & SRT Process Scheduling Algorithm

A.4--- Theory:

Shortest-Job-First (SJF) is a non-pre-emptive discipline in which waiting job (or process) with the smallest estimated run-time-to-completion is run next. In other words, when CPU is available, it is assigned to the process that has smallest next CPU burst.
The SJF scheduling is especially appropriate for batch jobs for which the run times are known in advance. Since the SJF scheduling algorithm gives the minimum average time for a given set of processes, it is probably optimal. The SJF algorithm favours short jobs (or processors) at the expense of longer ones. The obvious problem with SJF scheme is that it requires precise knowledge of how long a job or process will run, and this information is not usually available. The best SJF algorithm can do is to rely on user estimates of run times.
In the production environment where the same jobs run regularly, it may be possible to provide reasonable estimate of run time, based on the past performance of the process. But in the development environment users rarely know how their program will execute.
Like FCFS, SJF is non pre-emptive therefore, it is not useful in timesharing environment in which reasonable response time must be guaranteed

The preemptive version of SJF is known as Shortest Remaining Time First (SRT) Algorithm

A.5--- Procedure:
Task:

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1. Study SJF & SRT Process Scheduling Algorithm
2. Implement SJF & SRT Scheduling algorithm with 5 processes.
3. Save and close the file and name it as **EXP4_ your Roll no.**

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PART B

(PART B: TO BE COMPLETED BY STUDENTS)

Roll No: B083	Name: Vedant Sahai
Class: B.tech Computer engineering	Batch:B2
Date of Experiment :	Date of Submission
Grade:	

B.1 Work done by student

```
package src.com.company;

import java.util.*;

public class SJF {
    public static void main(String args[])
    {
        Scanner sc = new Scanner(System.in);
        System.out.println ("enter no of process:");
        int n = sc.nextInt();
        String pid[] = new String[n];
        int at[] = new int[n];
        int bt[] = new int[n];
        int ct[] = new int[n];
        int ta[] = new int[n];
        int wt[] = new int[n];
        int f[] = new int[n
        int st=0, tot=0;
        float avgwt=0, avgta=0;

        for(int i=0;i<n;i++)
        {
            System.out.println ("enter process " + (i+1) + "
arrival time:");
            at[i] = sc.nextInt();
            System.out.println ("enter process " + (i+1) + " brust
time:");
```

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```
            bt[i] = sc.nextInt();
            pid[i] = "P"+(i+1);
            f[i] = 0;
        }
        boolean a = true;
        while(true)
        {
            int c=n, min=999;
            if (tot == n)
                break;
            for (int i=0; i<n; i++)
            {

                if ((at[i] <= st) && (f[i] == 0) && (bt[i]<min))
                {
                    min=bt[i];
                    c=i;
                }
            }

            if (c==n)
                st++;
            else
            {
                ct[c]=st+bt[c];
                st+=bt[c];
                ta[c]=ct[c]-at[c];
                wt[c]=ta[c]-bt[c];
                f[c]=1;
                tot++;
            }
        }
        System.out.println("\nProcessid Arrival time(AT) burst
time(BT) completion time(CT) turnaround time(TAT) Waiting time(WT)
Respose time(RT)");
        for(int i = 0 ;i < n;i++)
        {
            avgwt+= wt[i];
            avgta+= ta[i];
            System.out.println("\t"+pid[i] +"\t\t\t"+
at[i]+"\t\t\t\t"+bt[i]+"\t\t\t\t"+ct[i]+"\t\t\t\t\t"+ta[i]+"\t\t\t\
t\t\t"+wt[i]+"\t\t\t\t\t"+wt[i]);
        }
```

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```
        System.out.println();
        System.out.println("Average Turn Around Time: "+
(float)(avgta/n));
        System.out.println("Average Waiting Time: "+
(float)(avgwt/n));

        sc.close();
    }
}
```

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```
enter no of process:
5
enter process 1 arrival time:
3
enter process 1 brust time:
1
enter process 2 arrival time:
1
enter process 2 brust time:
4
enter process 3 arrival time:
4
enter process 3 brust time:
2
enter process 4 arrival time:
0
enter process 4 brust time:
6
enter process 5 arrival time:
2
enter process 5 brust time:
3
```

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```
Processid Arrival time(AT) burst time(BT) completion time(CT) turnaround time(TAT) Waiting time(WT) Respose time(RT)
    P1          3              1              7                4                    3                 3
    P2          1              4              16               15                   11                11
    P3          4              2              9                5                    3                 3
    P4          0              6              6                6                    0                 0
    P5          2              3              12               10                   7                 7

Average Turn Around Time: 8.0
Average Waiting Time: 4.8
```

SRTF

```
package src.com.company;

import java.util.*;

public class SRTF {
    public static void main (String args[])
    {
        Scanner sc=new Scanner(System.in);
        System.out.println ("enter no of process:");
        int n= sc.nextInt();
        String pid[] = new String[n];
        int at[] = new int[n];
        int bt[] = new int[n];
        int ct[] = new int[n];
        int ta[] = new int[n];
        int wt[] = new int[n];
        int f[] = new int[n];
        int k[]= new int[n];
        int i, st=0, tot=0;
        float avgwt=0, avgta=0;

        for (i=0;i<n;i++)
        {
            pid[i]= "P"+(i+1);
            System.out.println ("enter process " +(i+1)+ " arrival
time:");
            at[i]= sc.nextInt();
            System.out.println("enter process " +(i+1)+ " burst
time:");
            bt[i]= sc.nextInt();
            k[i]= bt[i];
```

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```
            f[i]= 0;
        }

        while(true){
            int min=99,c=n;
            if (tot==n)
                break;

            for ( i=0;i<n;i++)
            {
                if ((at[i]<=st) && (f[i]==0) && (bt[i]<min))
                {
                    min=bt[i];
                    c=i;
                }
            }

            if (c==n)
                st++;
            else
            {
                bt[c]--;
                st++;
                if (bt[c]==0)
                {
                    ct[c]= st;
                    f[c]=1;
                    tot++;
                }
            }
        }

        for(i=0;i<n;i++)
        {
            ta[i] = ct[i] - at[i];
            wt[i] = ta[i] - k[i];
            avgwt+= wt[i];
            avgta+= ta[i];
        }

        System.out.println("\nProcessid Arrival time(AT) burst
time(BT) completion time(CT) turnaround time(TAT) Waiting
time(WT)");
```

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```
        for(i = 0 ;i < n;i++)
        {
            System.out.println("\t"+pid[i] +"\t\t\t"+
at[i]+"\t\t\t\t"+k[i]+"\t\t\t\t"+ct[i]+"\t\t\t\t\t"+ta[i]+"\t\t\t\t
\t\t"+wt[i]);
        }
        System.out.println();
        System.out.println("Average Turn Around Time: "+
(float)(avgta/n));
        System.out.println("Average Waiting Time: "+
(float)(avgwt/n));
        sc.close();
    }
}
```

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```
enter no of process:
5
enter process 1 arrival time:
3
enter process 1 burst time:
1
enter process 2 arrival time:
1
enter process 2 burst time:
4
enter process 3 arrival time:
4
enter process 3 burst time:
2
enter process 4 arrival time:
0
enter process 4 burst time:
6
enter process 5 arrival time:
2
enter process 5 burst time:
3
```

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```
Processid Arrival time(AT) burst time(BT) completion time(CT) turnaround time(TAT) Waiting time(WT)
    P1          3              1              4                  1                      0
    P2          1              4              6                  5                      1
    P3          4              2              8                  4                      2
    P4          0              6              16                 16                     10
    P5          2              3              11                 9                      6

Average Turn Around Time: 7.0
Average Waiting Time: 3.8
```

B.2 Conclusion:

We have successfully studied and implemented various Process Scheduling Algorithm and implementation of Shortest Job First algorithm and Shortest Remaining Job (SJF with Pre-emption).

B.3 Questions of Curiosity:

Q1. What is the Average Waiting time and Turnaround time for the implemented SJF example?

```
Average Turn Around Time: 8.0
Average Waiting Time: 4.8
```

Q2. What is the Average Waiting time and Turnaround time for the implemented SRT example?

```
Average Turn Around Time: 7.0
Average Waiting Time: 3.8
```

Q3. Which algorithm out of SJF & SRT is more advantageous? Justify your answer.

Shortest Job First (SJF) is an algorithm in which the process having the smallest execution time is chosen for the next execution. This scheduling method can be preemptive or non-preemptive. It significantly reduces the average waiting time for other processes awaiting execution. The full form of SJF is Shortest Job First.

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In Preemptive SRTF Scheduling, jobs are put into the ready queue as they come. A process with shortest burst time begins execution. If a process with even a shorter burst time arrives, the current process is removed or preempted from execution, and the shorter job is allocated CPU cycle.

Shortest Job First:	Shortest Remaining Job First:
It is a non-preemptive algorithm.	It is a preemptive algorithm.
It involves less overheads than SRJF.	It involves more overheads than SJF.
It is slower in execution than SRJF.	It is faster in execution than SJF.
It leads to comparatively lower throughput.	It leads to increased throughput as execution time is less.
It minimizes the average waiting time for each process.	It may or may not minimize the average waiting time for each process.
It may suffer from priority inversion.	It may suffer from convoy effect.
It involves lesser number of context switching.	It involves higher number of context switching.
Short processes are executed first and then followed by longer processes.	Shorter processes run fast and longer processes show poor response time.

As we can see from the average waiting time and average turn around time is less for SRT compared to SJF so using SRT algorithm is advantageous.