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Practical aim: Non-Preemitive CPU Schedualing algorithm where each process with the smallest burst time is executed time.

Algorithm:

CPU scheduling algorithm are used for scheduling different process present in the ready queue with available resource in an optimal way so that each and every process get execute by CPU

Scheduling algorithm are broadly classified into two main type namely preemptive and non-preemptive . FIRST COME FIRST OUT(FCFS) is also know as FIRST IN FIRST OUT (FIFO) SCHEDUAL algorithm is the and simplest CPU .

A process scheduling different process to be assigned to the CPU based on particular scheduling algorithm .there are six popular process scheduling algorithm which we are going to discuss in this chapter FIRST COME FIRST OUT(FCFS) scheduling

Example of SJF

Example 1: **Consider the following example contain five processes .**

Process Id	Burst Time
P0	**6**
P1	**3**
P2	**8**
P3	**3**
P4	**4**

Step 1: **Processes get execute according to their lowest burst time first .**

Process Id	Burst Time
P0	**6**
P1	**3**
P2	**8**
P3	**3**
P4	**4**

Step 2: **Following shows the scheduling and execution of processes**

    Step 2.1: **At start P1 shortest execution time which is 0-3 second.**

System time	0
Processes scheduling finish time	P1
Finish time	0+3=3
Wating time	3-3=0
Turn Around time	3-0=3

Step 2.2: **next shortest execution time is for process P3 for duration 3-6 second.**

System time	6
Processes scheduling finish time	P1,p3
Finish time	3+3=6
Wating time	6-3=3
Turn Around time	6-0=6

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Step 2.3: **Next job with shortest execution time is P4 for a duration 6-10 second.**

System time	10
Processes scheduling finish time	P1,p3'p4
Finish time	6+4=10
Wating time	10-4=6
Turn Around time	10-0=10

Step 2.4: **Next job with shortest execution time is p0 for duration of 10-16 second.**

System time	10
Processes scheduling finish time	P1,p3,p3,p4,p0
Finish time	10+6=16
Wating time	16-6=10
Turn Around time	16-0=16

Step 2.5 : **Similarly next job with shortest execution time is P2 for duration of 16-24 second.**

System time	16
Processes scheduling finish time	P1,p3,p3,p4,p0,p2

Finish time	16+8=24
Wating time	24-8=16
Turn Around time	24-0=24

Step 3: Calculate average wating time and average turn around time.

Average wating time = (0+3+6+10+16)/5
= 35/5
=7

Average turn around time =(3+6+10+16+24)/5
= 59/5
=11.8

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Gnatt Chart

Step 4: After scheduling of all provided processes.

Process id	Burst time	Arrival time	Finish time	Turn Around time	Wating time
P1	3	0	0+3=3	3-0=3	3-3=0
P3	3	0	3+3=6	6-0=6	6-3=3
P4	4	0	6+4=10	10-0=10	10-4=6
P0	6	0	10+6=16	16-0=16	16-6=10
P2	8	0	16+8=24	24-0=24	24-8=16
Average				11.8000000	7.000000

P1	P3	P4	P0	P2
0 3	6	10	16	24

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Example 2: **Consider the following example containing five processes arrive at same time.**

Processes ID	Burst Time
P0	2
P1	1
P2	6

Gnatt Chart

Process id	Burst time	Arrival time	Finish time	Turn Around time	Wating time
P1	1	0	1	1	1
P0	2	0	3	3	3
P2	6	0	9	9	9
Average				4.33333	1.33333

P1	P0	P2
0	1	3	9

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Example 3: Consider the following example contain five processes arrive at same time .

Process ID	Burst time
P0	25
P1	15
P2	10
P3	25
P4	10
P5	25

Process id	Burst time	Arrival time	Finish time	Turn Around time	Wating time
P2	10	0	10	10	0
P4	10	0	20	20	10
P1	15	0	35	35	20
P0	25	0	60	60	35
P3	25	0	85	85	60
P5	25	0	110	110	85
Average				53.3333	35.000000

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Gnatt chart:

Process id	Burst time	Arrival time	Finish time	Turn Around time	Wating time
P2	10	0	10	10	0
P4	10	0	20	20	10
P1	15	0	35	35	20
P0	25	0	60	60	35
P3	25	0	85	85	60
P5	25	0	110	110	85
Average				53.3333	35.000000

P2	P4	P1	P0	P3	P5

| 0 | 10 | 20 | 35 | 60 | 85 | 110 |

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Example 4: **Consider the following example contain five processes arrive at same time .**

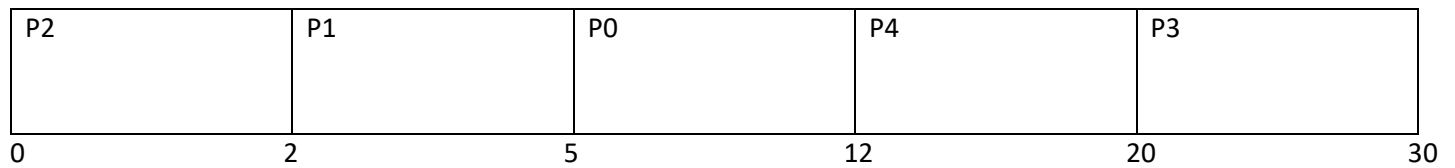| Process Id	Burst Time
P0	**7**
P1	**3**
P2	**2**
P3	**10**
P4	**8**

Step 4: **After scheduling of all provided processes.**

Process id	Burst time	Arrival time	Finish time	Turn Around time	Wating time
P2	2	0	2	2	0
P1	3	0	5	5	2
P0	7	0	12	12	5
P4	8	0	20	20	12
P3	10	0	30	30	20
Average				13.80000	7.800000

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Gnatt chart:

Process id	Burst time	Arrival time	Finish time	Turn Around time	Wating time
P2	2	0	2	2	0
P1	3	0	5	5	2
P0	7	0	12	12	5
P4	8	0	20	20	12
P3	10	0	30	30	20
Average				13.80000	7.800000

P2	P1	P0	P4	P3
0	2	5	12	20	30

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Implementation:

```java
//Name: Bhupendra Kamble

//Batch:B2

//PRN: 2020016400925867

//Date:23/7/2021

//Prac-02: SJF(with no preemption)Algorithm


import java.util.Scanner;


public class P2_SJF_BK
{
int burstTime[];

int arrivalTime[]={0};

String[] processId;

int numberOfProcess;

void getProcessData(Scanner input){

System.out.println("enter the number of process for Scheduling:");

int inputNumberOfProcess=input.nextInt();

numberOfProcess=inputNumberOfProcess;

burstTime=new int[numberOfProcess];

arrivalTime=new int[numberOfProcess];

processId=new String[numberOfProcess];

String st="p"; for(int i=0;i < numberOfProcess;i++){

processId[i]=st.concat(Integer.toString(i));

System.out.print("enter the burst time for process-"+(i)+":");

burstTime[i]=input.nextInt();

}
```

```
}

void sortAccordingBurstTime(int[] at,int[] bt,String[] pid){

boolean swapped;

int temp;

String stemp;

 for (int i=0; ;i<numberOfProcessi++){

swapped=false;

for (int j = 0;j<numberOfProcessbt[j+1]){

temp=bt[j];

bt[j]=bt[j+1];

bt[j+1]=temp;

 temp=at[j];

at[j]=at[j+1];

at[j+1]=temp;

stemp=pid[j];

pid[j]=pid[j+1];

pid[j+1]=stemp;

swapped=true;

}

}

if(swapped==false){

break;

}

}

}

void shortestJobFirstNPAlgorithm(){

int finishTime[]=new int[numberOfProcess];

int bt[]=burstTime.clone();
```

```java
int at[]=arrivalTime.clone();

String pid[]=processId.clone();

int waitingTime[]=new int[numberOfProcess];

int turnAroundTime[]=new int[numberOfProcess];

sortAccordingBurstTime(at,bt,pid);

finishTime[0]=at[0]+bt[0];turnAroundTime[0]=finishTime[0]-at[0];

waitingTime[0]=turnAroundTime[0]-bt[0];

for(int i=1;i<numberOfProcess;i++){

finishTime[i]=bt[i]+finishTime[i-1];

turnAroundTime[i]=finishTime[i]-at[i];

waitingTime[i]=turnAroundTime[i]-bt[i];

}

float sum=0;

for(int n:waitingTime){

sum+=n;

}

float averageWaitingTime=sum/numberOfProcess;

sum=0;

for(int n:turnAroundTime){

sum+=n;

}

float averageTurnAroundTime=sum/numberOfProcess;

System.out.println(" SJF (with no preemption) Scheduling algorithm :");

System.out.format("%20s%20s%20s%20s%20s%20s\n","ProcessId","BurstTime"

,"ArrivalTime","FinishTime","TurnAroundTime","WatingTime");

for(int i=0;i<numberOfProcess;i++){

System.out.format("%20s%20d%20d%20d%20d%20d\n",pid[i],bt[i],at[i]

,finishTime[i],turnAroundTime[i],waitingTime[i]);
```

```
}

System.out.format("%80s%20f%20f\n", "Average",averageTurnAroundTime,averageWaitingTime);

}

public static void main(String[] args){

Scanner input=new Scanner(System.in);P2_SJF_BK

obj=new P2_SJF_BK();obj.getProcessData(input);

obj.shortestJobFirstNPAlgorithm();

}

}
```

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INPUT:

INPUT1:

```
enter the number of process for Scheduling:
5
enter the burst time for process-0:6
enter the burst time for process-1:3
enter the burst time for process-2:8
enter the burst time for process-3:3
enter the burst time for process-4:4
```

Output:

```
SJF (with no preemption) Scheduling Algorithm :
        ProcessId       BurstTime       ArrivalTime     FinishTime      TurnAroundTime      WatingTime
            p1              3               0               3               3                   0
            p3              3               0               6               6                   3
            p4              4               0              10              10                   6
            p0              6               0              16              16                  10
            p2              8               0              24              24                  16
                                                            Average     11.800000           7.000000
```

Sample output:

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Input2:

```
enter the burst time for process-0:2
enter the burst time for process-1:1
enter the burst time for process-2:6
SJF (with no preemption) Scheduling Algorithm :
        ProcessId        BurstTime        ArrivalTime        FinishTime        TurnAroundTime        WatingTime
```

Output:

```
SJF (with no preemption) Scheduling Algorithm :
        ProcessId        BurstTime        ArrivalTime        FinishTime        TurnAroundTime        WatingTime
            p1               1                 0                  1                 1                     0
            p0               2                 0                  3                 3                     1
            p2               6                 0                  9                 9                     3
                                                            Average          4.333333              1.333333

C:\Users\SD CONSULTANTS\OneDrive\Desktop>
```

Sample output:

```
enter the number of process for Scheduling:
3
enter the burst time for process-0:2
enter the burst time for process-1:1
enter the burst time for process-2:6
SJF (with no preemption) Scheduling Algorithm :
        ProcessId        BurstTime        ArrivalTime        FinishTime        TurnAroundTime        WatingTime
            p1               1                 0                  1                 1                     0
            p0               2                 0                  3                 3                     1
            p2               6                 0                  9                 9                     3
                                                            Average          4.333333              1.333333

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```

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Input3:

```
enter the burst time for process-0:7
enter the burst time for process-1:3
enter the burst time for process-2:2
enter the burst time for process-3:10
enter the burst time for process-4:8
SJF (with no preemption) Scheduling Algorithm :
```

Output:

```
SJF (with no preemption) Scheduling Algorithm :
        ProcessId       BurstTime       ArrivalTime     FinishTime      TurnAroundTime      WatingTime
            p2              2               0               2               2                   0
            p1              3               0               5               5                   2
            p0              7               0               12              12                  5
            p4              8               0               20              20                  12
            p3              10              0               30              30                  20
                                                            Average         13.800000          7.800000

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```

Sample output:

```
enter the number of process for Scheduling:
5
enter the burst time for process-0:7
enter the burst time for process-1:3
enter the burst time for process-2:2
enter the burst time for process-3:10
enter the burst time for process-4:8
SJF (with no preemption) Scheduling Algorithm :
        ProcessId       BurstTime       ArrivalTime     FinishTime      TurnAroundTime      WatingTime
            p2              2               0               2               2                   0
            p1              3               0               5               5                   2
            p0              7               0               12              12                  5
            p4              8               0               20              20                  12
            p3              10              0               30              30                  20
                                                            Average         13.800000          7.800000

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```

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Input:

```
enter the burst time for process-0:25
enter the burst time for process-1:15
enter the burst time for process-2:10
enter the burst time for process-3:25
enter the burst time for process-4:10
enter the burst time for process-5:25
SJF (with no preemption) Scheduling Algorithm :
        ProcessId        BurstTime        ArrivalTime        FinishTime        TurnAroundTime        WatingTime
```

Output:

```
SJF (with no preemption) Scheduling Algorithm :
        ProcessId        BurstTime        ArrivalTime        FinishTime        TurnAroundTime        WatingTime
                p2            10                0                10                10                    0
                p4            10                0                20                20                   10
                p1            15                0                35                35                   20
                p0            25                0                60                60                   35
                p3            25                0                85                85                   60
                p5            25                0               110               110                  85
                                                              Average          53.333332            35.000000

C:\Users\SD CONSULTANTS\OneDrive\Desktop>
```

Sample output:

```
enter the burst time for process-0:25
enter the burst time for process-1:15
enter the burst time for process-2:10
enter the burst time for process-3:25
enter the burst time for process-4:10
enter the burst time for process-5:25
SJF (with no preemption) Scheduling Algorithm :
        ProcessId        BurstTime        ArrivalTime        FinishTime        TurnAroundTime        WatingTime
                p2            10                0                10                10                    0
                p4            10                0                20                20                   10
                p1            15                0                35                35                   20
                p0            25                0                60                60                   35
                p3            25                0                85                85                   60
                p5            25                0               110               110                  85
                                                              Average          53.333332            35.000000

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```

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