1. Write a C program to simulate the following non-pre-emptive CPU scheduling algorithm to find turnaround time and waiting time.
   FCFS
   SJF (pre-emptive & Non-pre-emptive)

Code:

```
#include <stdio.h>
int at[10], pt[10], ia, ip, n;
int tat[10], wt[10], it, iw, pos, j, i;
float atat = 0, awt = 0;
void fcfs()
{
    int t;
    printf("Enter number of processes: ");
    scanf("%d", &n);

    printf("Enter arrival times:\n");
    for (ia = 0; ia < n; ia++)
        scanf("%d", &at[ia]);

    printf("Enter process times:\n");
    for (ip = 0; ip < n; ip++)
        scanf("%d", &pt[ip]);

    if (at[0] == at[1])
    {
        t = pt[1];
        pt[1] = pt[0];
        pt[0] = t;
    }

    if (at[0] != 0)
        tat[0] = at[0];

    for (it = 0; it < n; it++)
        tat[it] = 0;

    int i = 0;
    for (it = 0; it < n; it++)
    {
        while (i <= it)
            tat[it] += pt[i++];
        i = 0;
    }
```

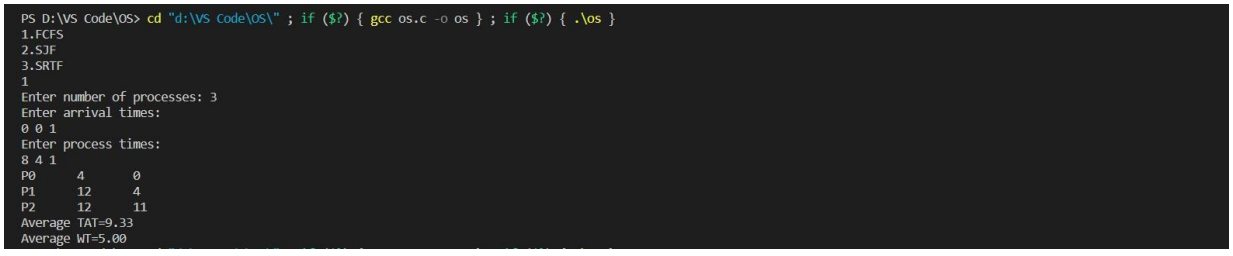
```
    for (it = 0; it < n; it++)
        tat[it] = tat[it] - at[it];

    for (ia = 0; ia < n; ia++)
        wt[ia] = tat[ia] - pt[ia];

    for (i = 0; i < n; i++)
    {
        atat += tat[i];
        awt += wt[i];
    }

    atat = atat / n;
    awt = awt / n;

    for (i = 0; i < n; i++)
    {
        printf("P%d\t%d\t%d\n", i, tat[i], wt[i]);
    }

    printf("Average TAT=%.2f\nAverage WT=%.2f\n", atat, awt);
}

void srtf()
{
    int rt[10], endTime, i, smallest;
    int remain = 0, time, sum_wait = 0, sum_turnaround = 0;
    printf("Enter no of Processes : ");
    scanf("%d",  &n);
    printf("Enter arrival times\n");
    for (i = 0; i < n; i++)
    {
        scanf("%d", &at[i]);
    }
    printf("Enter Process times \n");
    for (i = 0; i < n; i++)
    {
        scanf("%d", &pt[i]);
        rt[i] = pt[i];
    }
    rt[9] = 9999;
    for (time = 0; remain != n; time++)
    {
        smallest = 9;
        for (i = 0; i < n; i++)
        {
```

```
            if (at[i] <= time && rt[i] < rt[smallest] && rt[i] > 0)
            {
                smallest = i;
            }
        }
        rt[smallest]--;
        if (rt[smallest] == 0)
        {
            remain++;
            endTime = time + 1;
            printf("\nP%d  %d  %d", smallest + 1, endTime - at[smallest], endTime - pt[smallest] -
at[smallest]);
            sum_wait += endTime - pt[smallest] - at[smallest];
            sum_turnaround += endTime - at[smallest];
        }
    }
    printf("\n\nAverage waiting time = %f\n", sum_wait * 1.0 / n);
    printf("Average Turnaround time = %f", sum_turnaround * 1.0 / n);
}

void sjf()
{
    int completed =  0;
    int currentTime = 0;
    int complete[n], ct[n];

    printf("Enter number of processes: ");
    scanf("%d", &n);

    printf("Enter arrival times:\n");
    for (int ia = 0; ia < n; ia++)
        scanf("%d", &at[ia]);

    printf("Enter process times:\n");
    for (int ip = 0; ip < n; ip++)
        scanf("%d", &pt[ip]);

    for (int i = 0; i < n; i++)
    {
        complete[i] = 0;
        ct[i] = 0;
    }

    while (completed != n)
    {
        int shortest = -1;
```

```
    int min_bt = 9999;

    for (int i = 0; i < n; i++)
    {
        if (at[i] <= currentTime && complete[i] == 0)
        {
            if (pt[i] < min_bt)
            {
                min_bt = pt[i];
                shortest = i;
            }
            if (pt[i] == min_bt)
            {
                if (at[i] < at[shortest])
                {
                    shortest = i;
                }
            }
        }
    }

    if (shortest == -1)
    {
        currentTime++;
    }
    else
    {
        ct[shortest] = currentTime + pt[shortest];
        tat[shortest] = ct[shortest] - at[shortest];
        wt[shortest] = tat[shortest] - pt[shortest];
        complete[shortest] = 1;
        completed++;
        currentTime = ct[shortest];
    }
}

for (int i = 0; i < n; i++)
{
    atat += tat[i];
    awt += wt[i];
}

atat = atat / n;
awt = awt / n;

for (int i = 0; i < n; i++)
```

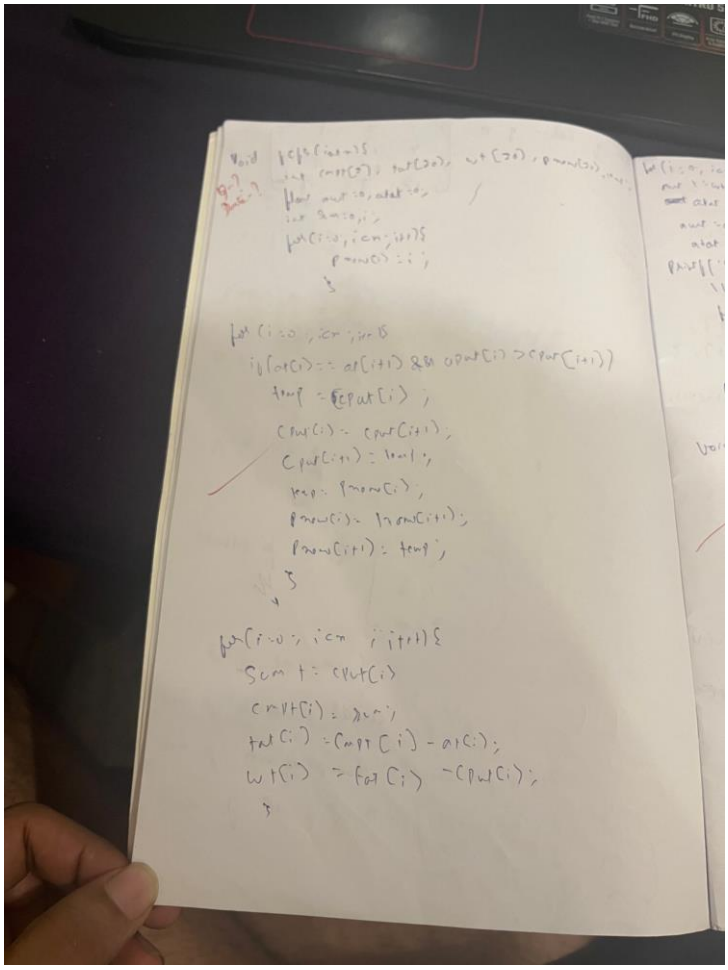
```
    {
        printf("P%d\t%d\t%d\n", i, tat[i], wt[i]);
    }

    printf("\nAverage TAT = %f\nAverage WT = %f\n", atat, awt);
}

void main()
{
    int op = 1, x;
    printf("1.FCFS \n2.SJF \n3.SRTF\n");
    scanf("%d", &x);
    switch (x)
    {
    case 1:
        fcfs();
        break;
    case 2:
        sjf();
        break;

    case 3:
        srtf();
        break;

    default:
        printf("Invalid option \n");
    }
}
```

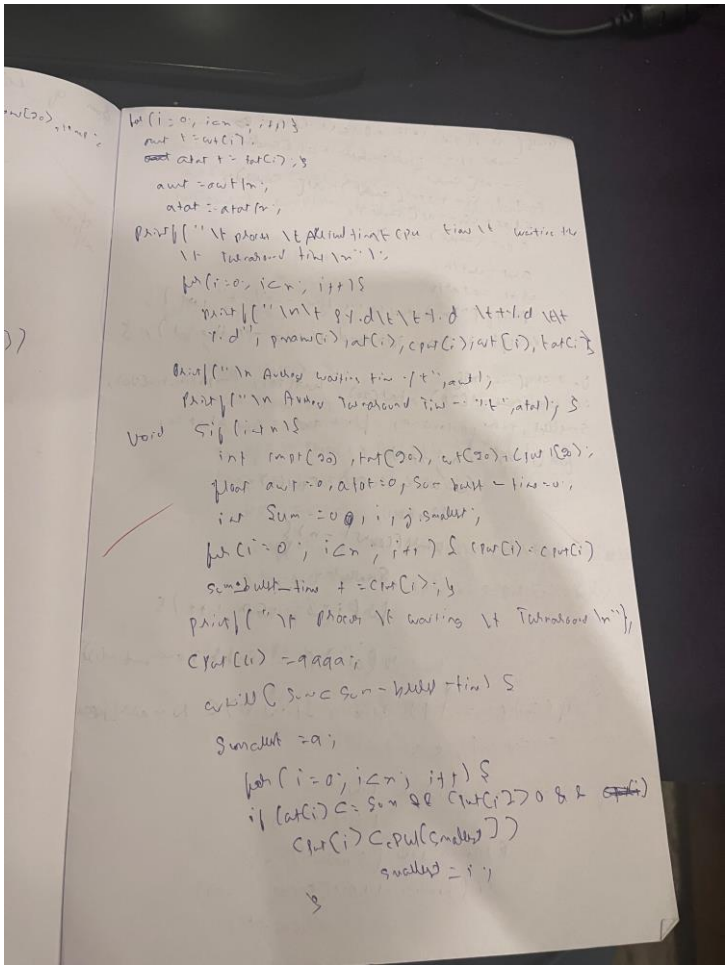
Output:

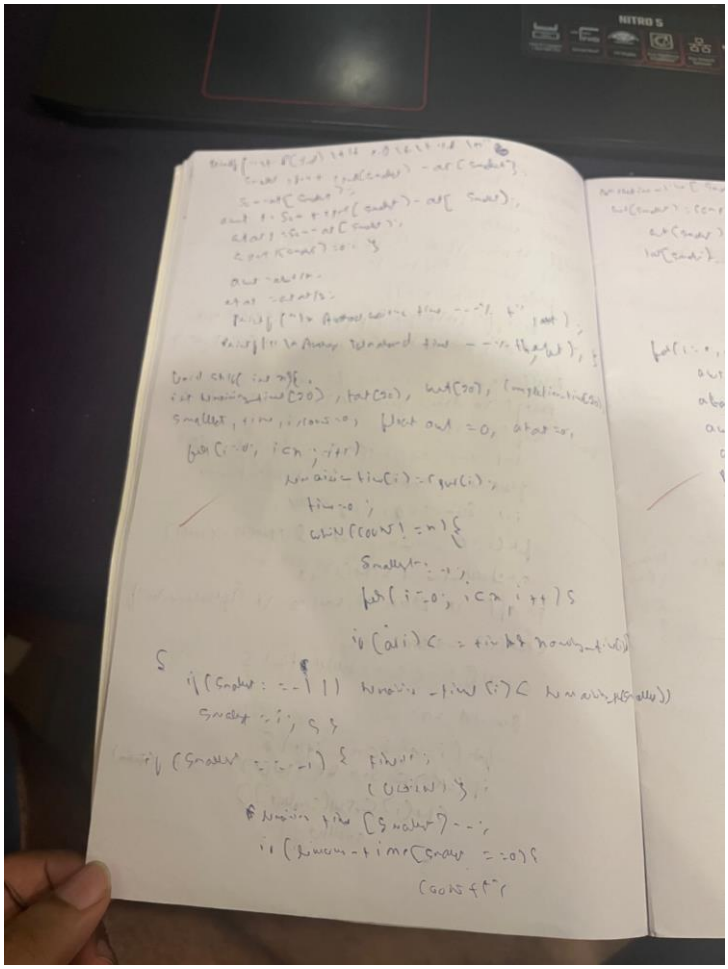


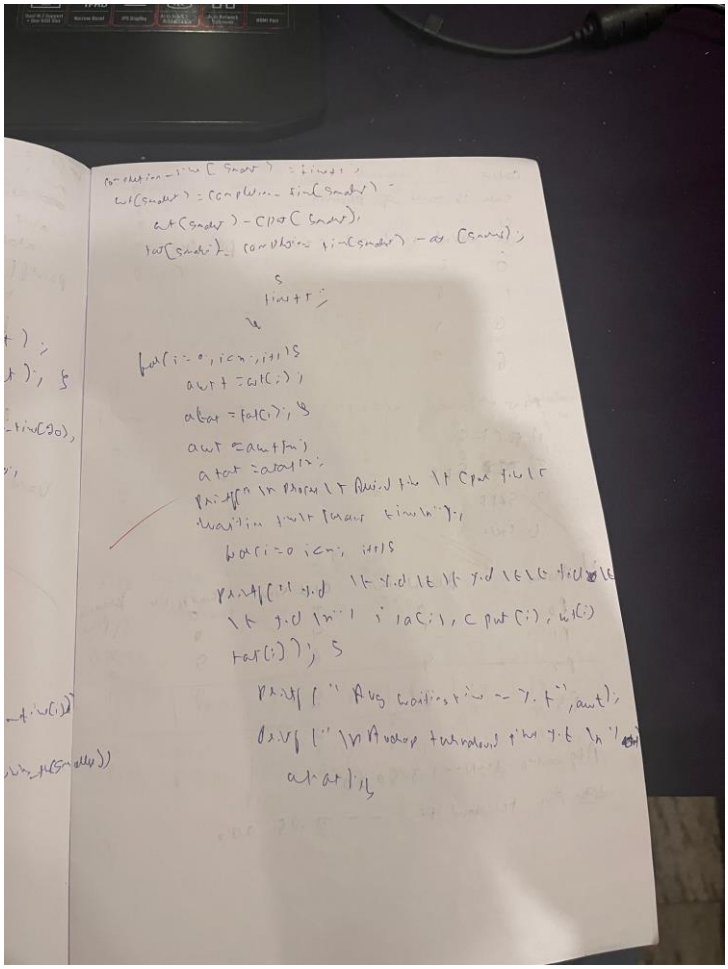
```
PS D:\VS Code\OS> cd "d:\VS Code\OS\" ; if ($?) { gcc os.c -o os } ; if ($?) { .\os }
1.FCFS
2.SJF
3.SRTF
2
Enter number of processes: 3
Enter arrival times:
0 0 1
Enter process times:
8 4 1
P0      13      5
P1      4       0
P2      4       3

Average TAT = 7.000000
Average WT = 2.666667
PS D:\VS Code\OS>
```

```
PS D:\VS Code\OS> cd "d:\VS Code\OS\" ; if ($?) { gcc os.c -o os } ; if ($?) { .\os }
1.FCFS
2.SJF
3.SRTF
3
Enter no of Processes : 3
Enter arrival times
0 0 1
Enter Process times
8 4 1

P3  1  0
P2  5  1
P1  13  5

Average waiting time = 2.000000
Average Turnaround time = 6.333333
PS D:\VS Code\OS>
```






NITRO 5



Output

Enter the number of process

4

Enter arrival time and CPU time for each

0 3

1 6

4 5

6 2

menu

1) FCFS

2) SJF

3) SRTF

4) RR

1)

Process	Arrival time	CPU time	Waiting time	Turnaround time
P0	0	3	0	3
P1	1	4	2	8
P2	4	6	5	9
P3	6	2	7	9

Avg waiting time -- 3.5000

Avg turnaround time -- 7.25 00

2)

Process

P(0)

P(1)

P(2)

P(3)

Avg wai[illegible]

Avg t[illegible]

3)

Process

0

1

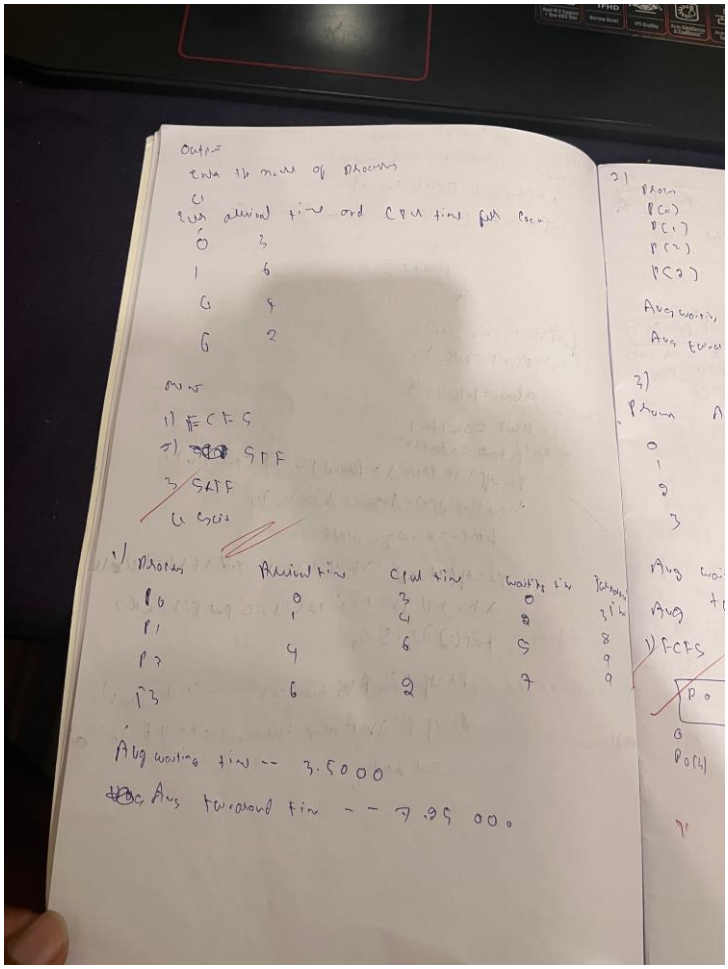
2

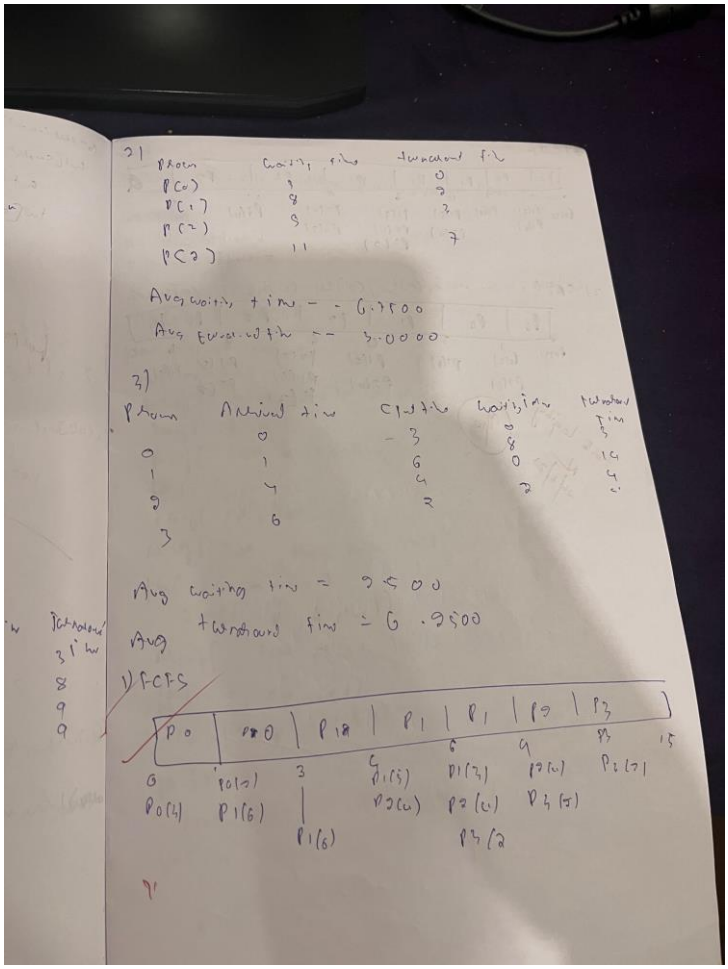
3

Avg

Avg

1) FC[illegible]


Output
Enter the no of Processes
4
Enter arrival time and CPU time for each
0 3
1 6
4 5
6 2
ENTER
1) FCFS
2) SJF
3) SRTF
4) RR
1) Process
Arrival time
CPU time
Waiting time
Turnaround time
P0
P1
P2
P3
Avg waiting time -- 3.5000
Avg turnaround time -- 7.25 00.
2)
Process
P(0)
P(1)
P(2)
P(3)
Avg waiting
Avg Turnaround
3)
Process
0
1
2
3
Avg
Avg
1) FCFS
P0
0
P0(4)



2) SJF

P0	P0	P1	P1	P1	P3	P2

0 1 2 4 6 9 11 15

P0(3) P0(2) P2(6) P1(5) P1(3) P2(4) P3(4)
P1(6) P2(4) P2(4) P2(7)
P3(7)

3) SRTF

P0	P0	P1	P2	P2	P3	P1

1 3 4 6 8 10 15

P0(3) P0(2) P1(6) P1(5) P2(2) P1(5) P1(5)
P1(6) P2(4) P1(5) P3(4)
P3(7)

Write legibly

9/10

26/6/23

28-6-23

To simu

~~initial~~
#includ
#incl
int a
p[s
float
vo
p