[Process management Based practical]

In an operating system three CPU-intensive processes are ready for execution, which require 10ns, 20ns and 30ns and arrival at times 0ns, 2ns and 6ns, respectively. Write a Program to calculate the total number of context switches needed if the operating system implements a shortest job first (preemptive) scheduling algorithm. Also calculate the average time for which the processes have to wait before getting the CPU.

```
  GNU nano 8.7
#include <stdio.h>

int main() {
    int n = 3;
    int at[3] = {0, 2, 6};
    int bt[3] = {10, 20, 30};
    int rt[3];            // remaining time
    int ct[3], wt[3], tat[3];

    int time = 0, completed = 0;
    int prev = -1, cs = 0; // context switches

    for (int i = 0; i < n; i++)
        rt[i] = bt[i];

    while (completed < n) {
        int idx = -1;
        int min_rt = 9999;

        for (int i = 0; i < n; i++) {
            if (at[i] <= time && rt[i] > 0 && rt[i] < min_rt) {
                min_rt = rt[i];
                idx = i;
            }
        }

        if (idx == -1) {
            time++;
            continue;
        }

        if (prev != -1 && prev != idx)
            cs++;

        prev = idx;
        rt[idx]--;
        time++;

        if (rt[idx] == 0) {
            completed++;
            ct[idx] = time;
            tat[idx] = ct[idx] - at[idx];
            wt[idx] = tat[idx] - bt[idx];
        }
    }

    float avg_wt = 0;
    printf("\nProcess\tAT\tBT\tCT\tWT\tTAT\n");
    for (int i = 0; i < n; i++) {
        printf("P%d\t%d\t%d\t%d\t%d\t%d\n",
               i+1, at[i], bt[i], ct[i], wt[i], tat[i]);
        avg_wt += wt[i];
    }

    avg_wt /= n;

    printf("\nTotal Context Switches = %d", cs);
    printf("\nAverage Waiting Time = %.2f\n", avg_wt);

    return 0;
}
```

Output

```
Dhanashri@LAPTOP-9O3LMFMK MINGW64 ~
$ nano sjfprim.c

Dhanashri@LAPTOP-9O3LMFMK MINGW64 ~
$ gcc sjfprim.c -o sjfprim

Dhanashri@LAPTOP-9O3LMFMK MINGW64 ~
$ ./sjfprim

Process AT      BT      CT      WT      TAT
P1      0       10      10      0       10
P2      2       20      30      8       28
P3      6       30      60      24      54

Total Context Switches = 2
Average Waiting Time = 10.67

Dhanashri@LAPTOP-9O3LMFMK MINGW64 ~
$
```