REPORT
ON
OPERATING SYSTEMS (316)

SUBMITTED TO: ISHA MAM (28828)

LOVELY PROFESSIONAL UNIVERSITY

SUBMITTED BY

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REGISTRATION NUMBER: 12109458

ROLL NO : RK21MDB48

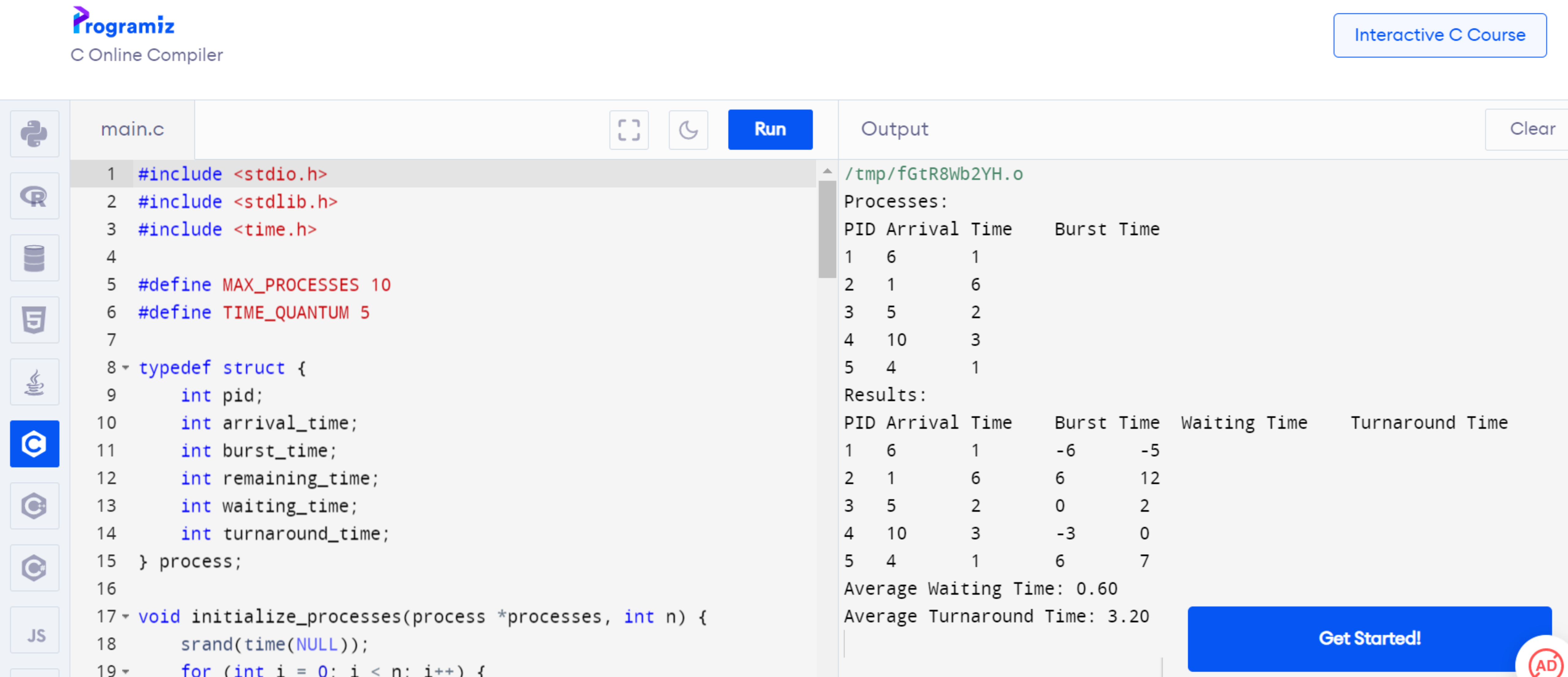
SECTION: K21MD

GROUP: 1

QUESTION

You are a computer systems engineer working at a large technology company. Your manager has tasked you with creating a simulation program to test the performance of the Round Robin scheduling algorithm. The simulation program should generate a set of "processes" with random arrival times and CPU burst times, and should run the Round Robin algorithm for a set amount of time (e.g. 100 time units). The program should record the average waiting time and turnaround time for each process, and should compare the results with the ideal scenario of a perfect scheduler. Your manager is interested in the results of the simulation to evaluate how well the Round Robin algorithm would perform in a real-world scenario, and to identify any potential issues that need to be addressed. She has given you one week to complete the simulation and to prepare a report of your findings and conclusions. As a computer systems engineer, you will need to: a. Design and implement the simulation program using a programming language of your choice. b. Generate a set of "processes" with random arrival times and CPU burst times using a random number generator. c. Implement the Round Robin scheduling algorithm in the simulation program. d. Have the simulation program run for a set amount of time (e.g. 100 time units) and record the average waiting time and turnaround time for each process. e. Compare the results of the simulation with the ideal scenario of a perfect scheduler. f. Write a report of the findings and conclusion with the comparison of the results of the round robin scheduling algorithm with other scheduling algorithms such as First Come First Serve (FCFS)

INPUT



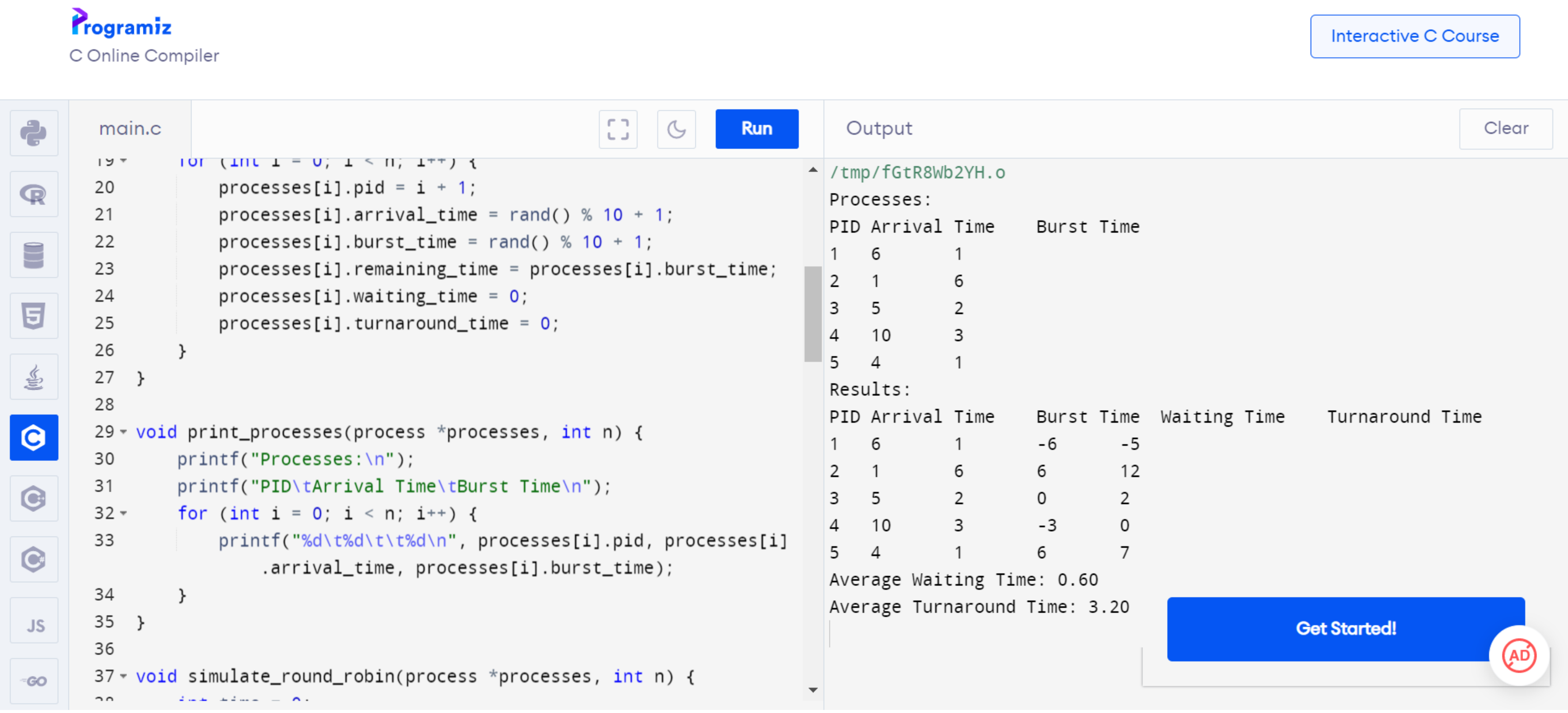
```c
#include <stdio.h>
#include <stdlib.h>
#include <time.h>

#define MAX_PROCESSES 10
#define TIME_QUANTUM 5

typedef struct {
    int pid;
    int arrival_time;
    int burst_time;
    int remaining_time;
    int waiting_time;
    int turnaround_time;
} process;

void initialize_processes(process *processes, int n) {
    srand(time(NULL));
    for (int i = 0; i < n; i++) {
```

```
/tmp/fGtR8Wb2YH.o
Processes:
PID Arrival Time    Burst Time
1   6       1
2   1       6
3   5       2
4   10      3
5   4       1
Results:
PID Arrival Time    Burst Time  Waiting Time    Turnaround Time
1   6       1       -6      -5
2   1       6       6       12
3   5       2       0       2
4   10      3       -3      0
5   4       1       6       7
Average Waiting Time: 0.60
Average Turnaround Time: 3.20
```



```c
    for (int i = 0; i < n; i++) {
        processes[i].pid = i + 1;
        processes[i].arrival_time = rand() % 10 + 1;
        processes[i].burst_time = rand() % 10 + 1;
        processes[i].remaining_time = processes[i].burst_time;
        processes[i].waiting_time = 0;
        processes[i].turnaround_time = 0;
    }
}

void print_processes(process *processes, int n) {
    printf("Processes:\n");
    printf("PID\tArrival Time\tBurst Time\n");
    for (int i = 0; i < n; i++) {
        printf("%d\t%d\t\t%d\n", processes[i].pid, processes[i]
            .arrival_time, processes[i].burst_time);
    }
}

void simulate_round_robin(process *processes, int n) {
    int time = 0;
```

```
/tmp/fGtR8Wb2YH.o
Processes:
PID Arrival Time    Burst Time
1   6       1
2   1       6
3   5       2
4   10      3
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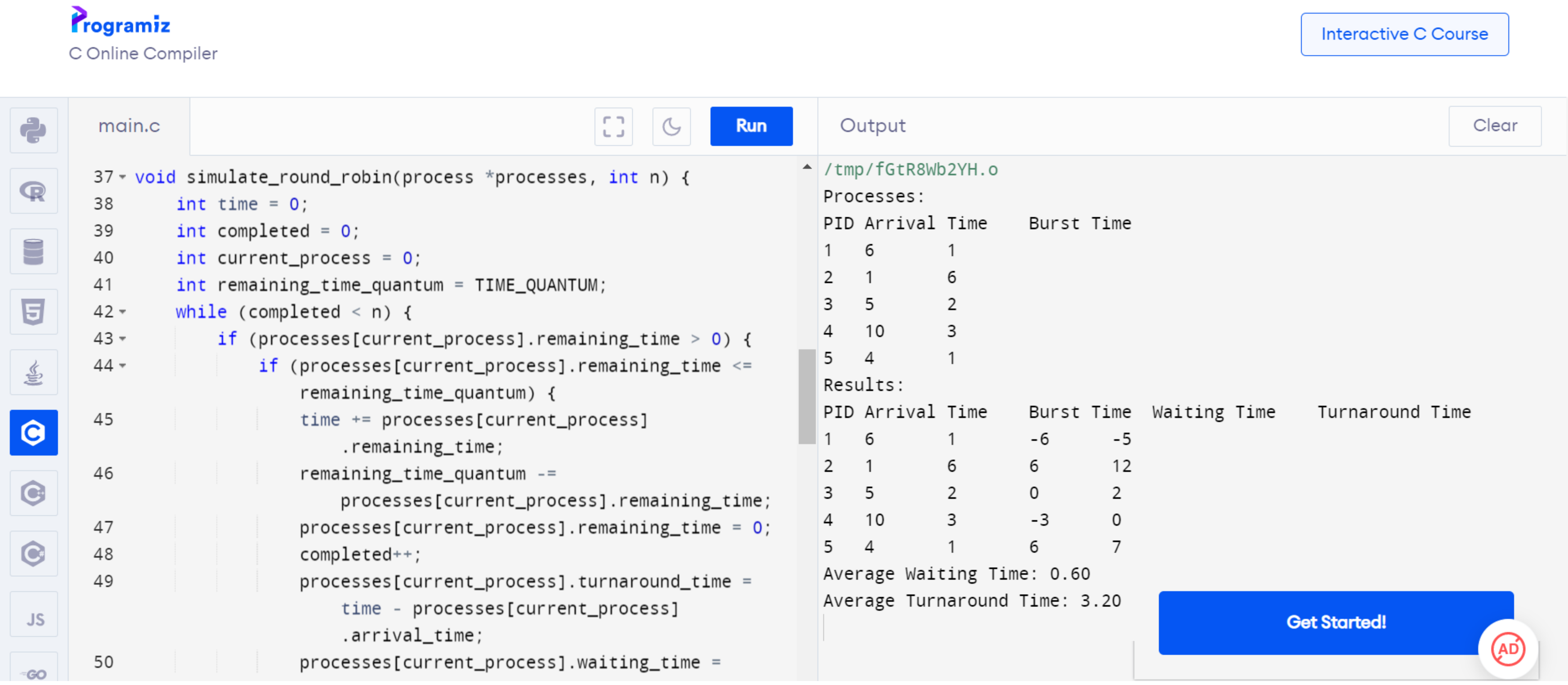

```c
void simulate_round_robin(process *processes, int n) {
    int time = 0;
    int completed = 0;
    int current_process = 0;
    int remaining_time_quantum = TIME_QUANTUM;
    while (completed < n) {
        if (processes[current_process].remaining_time > 0) {
            if (processes[current_process].remaining_time <=
                remaining_time_quantum) {
                time += processes[current_process]
                    .remaining_time;
                remaining_time_quantum -=
                    processes[current_process].remaining_time;
                processes[current_process].remaining_time = 0;
                completed++;
                processes[current_process].turnaround_time =
                    time - processes[current_process]
                    .arrival_time;
                processes[current_process].waiting_time =
```

```
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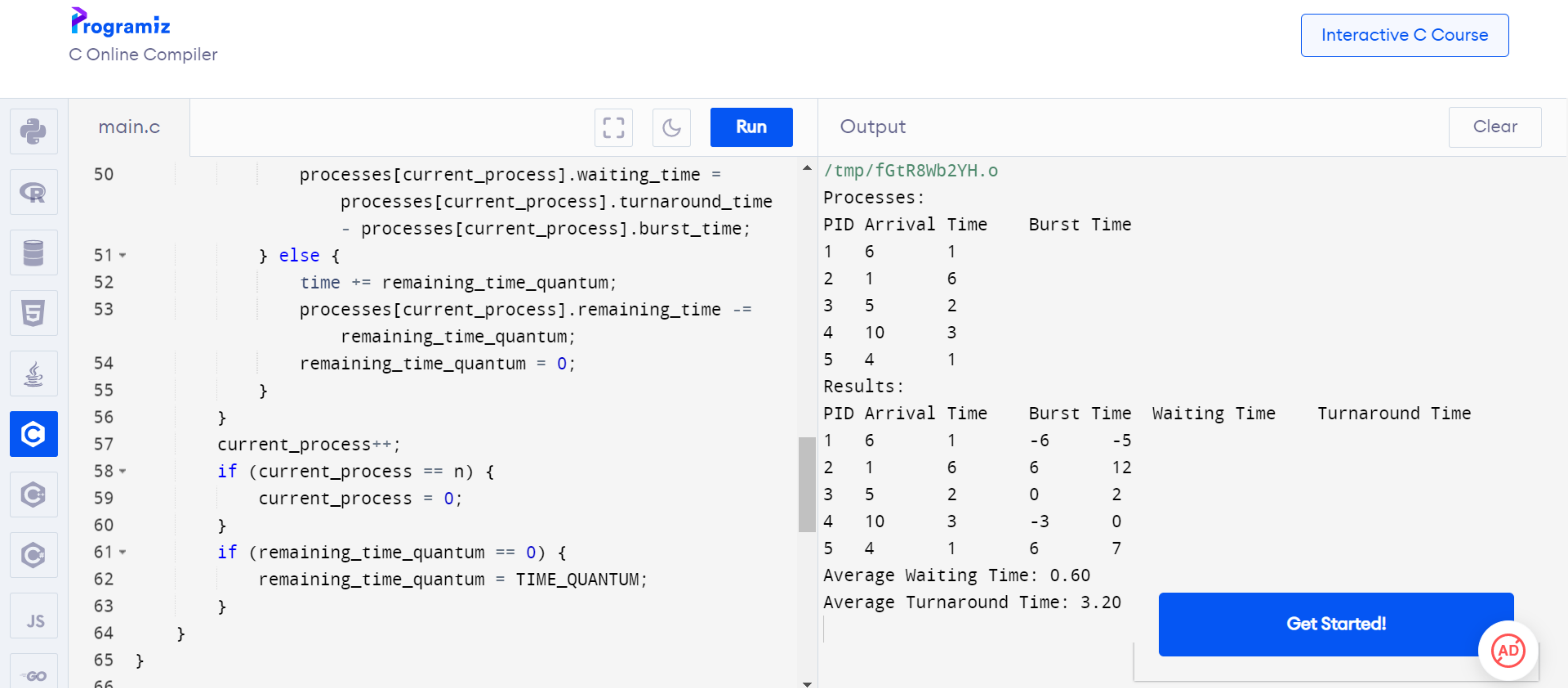

```c
                processes[current_process].waiting_time =
                    processes[current_process].turnaround_time
                    - processes[current_process].burst_time;
            } else {
                time += remaining_time_quantum;
                processes[current_process].remaining_time -=
                    remaining_time_quantum;
                remaining_time_quantum = 0;
            }
        }
        current_process++;
        if (current_process == n) {
            current_process = 0;
        }
        if (remaining_time_quantum == 0) {
            remaining_time_quantum = TIME_QUANTUM;
        }
    }
}
```

```
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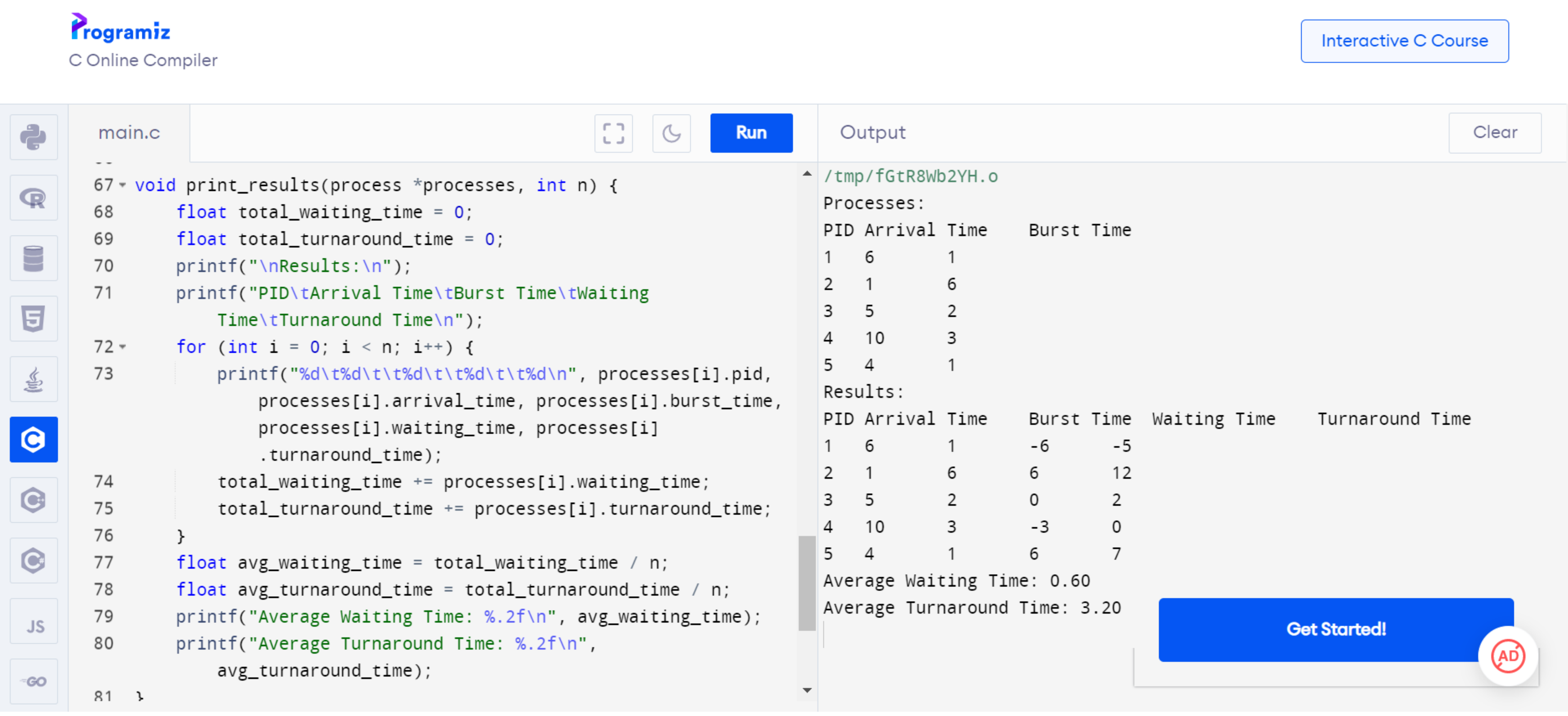

```c
void print_results(process *processes, int n) {
    float total_waiting_time = 0;
    float total_turnaround_time = 0;
    printf("\nResults:\n");
    printf("PID\tArrival Time\tBurst Time\tWaiting Time\tTurnaround Time\n");
    for (int i = 0; i < n; i++) {
        printf("%d\t%d\t\t%d\t\t%d\t\t%d\n", processes[i].pid, processes[i].arrival_time, processes[i].burst_time, processes[i].waiting_time, processes[i].turnaround_time);
        total_waiting_time += processes[i].waiting_time;
        total_turnaround_time += processes[i].turnaround_time;
    }
    float avg_waiting_time = total_waiting_time / n;
    float avg_turnaround_time = total_turnaround_time / n;
    printf("Average Waiting Time: %.2f\n", avg_waiting_time);
    printf("Average Turnaround Time: %.2f\n", avg_turnaround_time);
}
```

```
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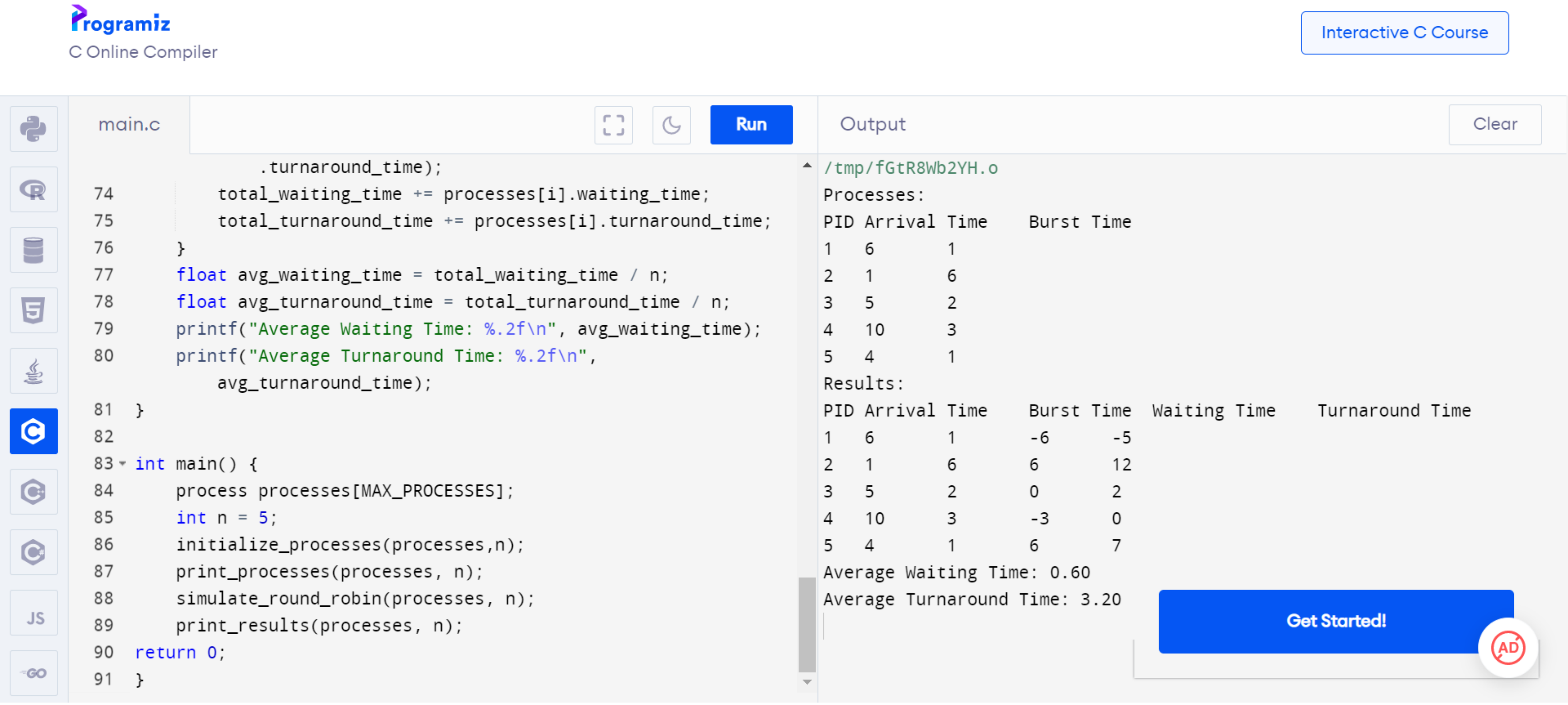

```c
                .turnaround_time);
        total_waiting_time += processes[i].waiting_time;
        total_turnaround_time += processes[i].turnaround_time;
    }
    float avg_waiting_time = total_waiting_time / n;
    float avg_turnaround_time = total_turnaround_time / n;
    printf("Average Waiting Time: %.2f\n", avg_waiting_time);
    printf("Average Turnaround Time: %.2f\n",
        avg_turnaround_time);
}

int main() {
    process processes[MAX_PROCESSES];
    int n = 5;
    initialize_processes(processes,n);
    print_processes(processes, n);
    simulate_round_robin(processes, n);
    print_results(processes, n);
return 0;
}
```

```
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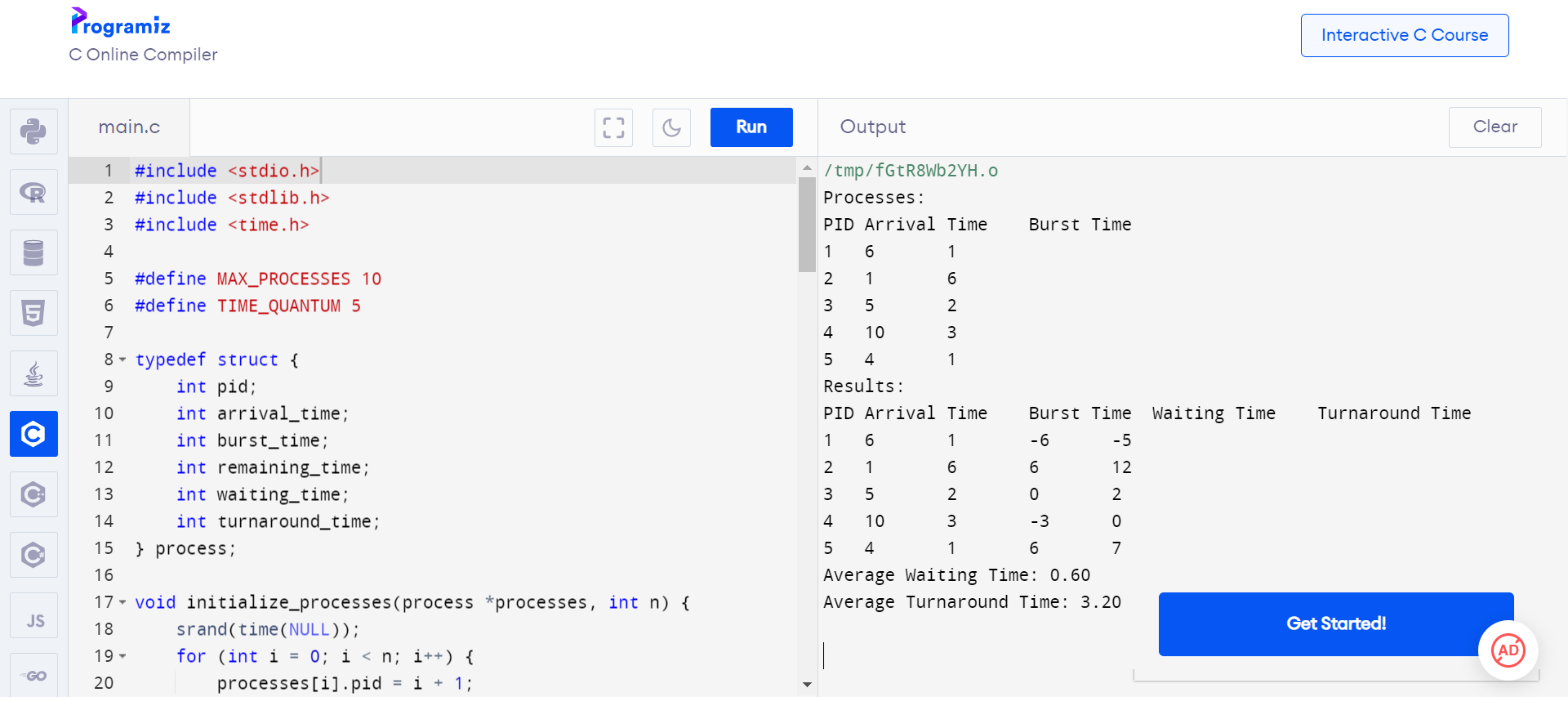
OUTPUT



```c
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#include <stdlib.h>
#include <time.h>

#define MAX_PROCESSES 10
#define TIME_QUANTUM 5

typedef struct {
    int pid;
    int arrival_time;
    int burst_time;
    int remaining_time;
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    int turnaround_time;
} process;

void initialize_processes(process *processes, int n) {
    srand(time(NULL));
    for (int i = 0; i < n; i++) {
        processes[i].pid = i + 1;
```

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