Operating Systems

UE20CS254

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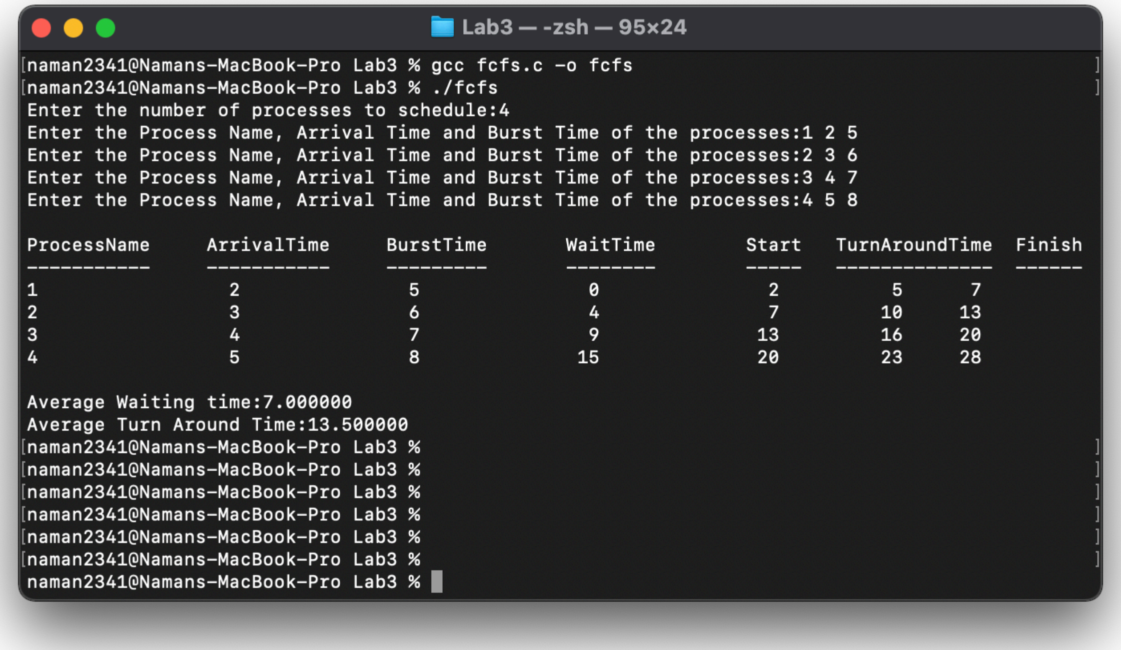
Week 3

Program Number	1
Program Qn	FCFS - First Come First Serve Scheduling
Code	

```c
//Program to demo "First Come First Serve" CPU scheduling

#include <stdio.h>
#include <string.h>

int main()
{
    char pn[10][10],t[10];
    int arr[10],bur[10],star[10],finish[10],tat[10],wt[10],i,j,n,temp;
    int totwt = 0, tottat = 0;

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

    for (i = 0; i < n; i++)
    {
        printf("Enter the Process Name, Arrival Time and Burst Time of the processes:");
        scanf("%s %d %d", pn[i], &arr[i], &bur[i]);
    }

    for (i = 0; i < n; i++)
    {
        for (j = 0; j < n; j++)
        {
            if (arr[i] < arr[j])
            {
           temp = arr[i];
           arr[i] = arr[j];
           arr[j] = temp;
           temp = bur[i];
           bur[i] = bur[j];
           bur[j] = temp;
           strcpy(t, pn[i]);
           strcpy(pn[i],pn[j]);
           strcpy(pn[j],t);
        }
    }
    }

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

```
 {
        if (i == 0)
       star[i] = arr[i];
        else
           star[i] = finish[i-1];

    wt[i]=star[i]-arr[i];
        finish[i]=star[i]+bur[i];
        tat[i]=finish[i]-arr[i];
    }


printf("\nProcessName\tArrivalTime\tBurstTime\tWaitTime\
tStart\tTurnAroundTime\tFinish");
    printf("\n-----------\t-----------\t---------
\t--------\t-----\t--------------\t------");

    for (i = 0; i < n; i++)
    {

printf("\n%s\t\t%3d\t\t%3d\t\t%3d\t\t%3d\t%6d\t\t%6d",pn
[i],arr[i],bur[i],wt[i],star[i],tat[i],finish[i]);
        totwt += wt[i];
        tottat += tat[i];
    }

    printf("\n\nAverage Waiting time:%f",(float)totwt/
n);
    printf("\nAverage Turn Around Time:%f\n",
(float)tottat/n);
    return 0;
}
```

Output



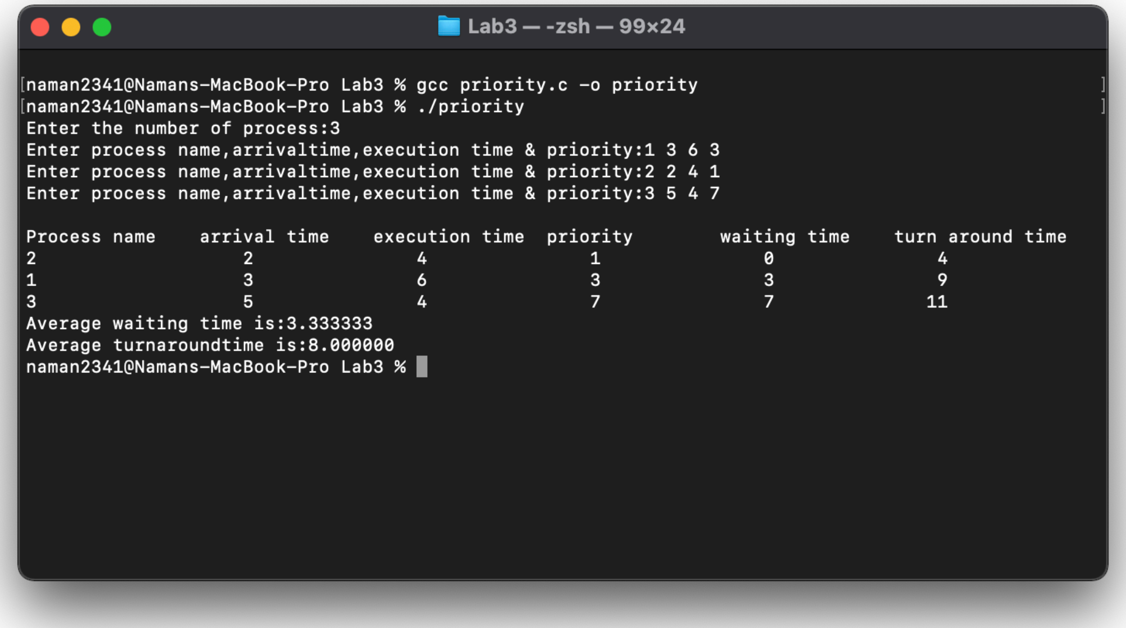
```
[naman2341@Namans-MacBook-Pro Lab3 % gcc fcfs.c -o fcfs
[naman2341@Namans-MacBook-Pro Lab3 % ./fcfs
Enter the number of processes to schedule:4
Enter the Process Name, Arrival Time and Burst Time of the processes:1 2 5
Enter the Process Name, Arrival Time and Burst Time of the processes:2 3 6
Enter the Process Name, Arrival Time and Burst Time of the processes:3 4 7
Enter the Process Name, Arrival Time and Burst Time of the processes:4 5 8

ProcessName     ArrivalTime     BurstTime       WaitTime        Start   TurnAroundTime  Finish
-----------     -----------     ---------       --------        -----   --------------  ------
1                 2               5               0               2          5      7
2                 3               6               4               7         10     13
3                 4               7               9              13         16     20
4                 5               8              15              20         23     28

Average Waiting time:7.000000
Average Turn Around Time:13.500000
[naman2341@Namans-MacBook-Pro Lab3 %
[naman2341@Namans-MacBook-Pro Lab3 %
[naman2341@Namans-MacBook-Pro Lab3 %
[naman2341@Namans-MacBook-Pro Lab3 %
[naman2341@Namans-MacBook-Pro Lab3 %
[naman2341@Namans-MacBook-Pro Lab3 %
naman2341@Namans-MacBook-Pro Lab3 %
```

Program Number	2
Program Qn	Priority Scheduling
Code	

```
//Program to demo priority scheduling

#include<stdio.h>
#include<string.h>

int main()
{
    int et[20],at[10],n,i,j,temp,p[10],st[10],ft[10],wt[10],ta[10];
    int totwt=0,totta=0;
    float awt,ata;
    char pn[10][10],t[10];

    printf("Enter the number of process:");
    scanf("%d",&n);
    for(i=0; i<n; i++)
    {
        printf("Enter process name,arrivaltime,execution time & priority:");
        scanf("%s%d%d%d",pn[i],&at[i],&et[i],&p[i]);
    }
    for(i=0; i<n; i++)
        for(j=0; j<n; j++)
        {
            if(p[i]<p[j])
            {
                temp=p[i];
                p[i]=p[j];
                p[j]=temp;
                temp=at[i];
                at[i]=at[j];
                at[j]=temp;
                temp=et[i];
                et[i]=et[j];
                et[j]=temp;
                strcpy(t,pn[i]);
                strcpy(pn[i],pn[j]);
                strcpy(pn[j],t);
            }
        }

    for(i=0; i<n; i++)
    {
        if(i==0)
        {
```

```
{
            st[i]=at[i];
            wt[i]=st[i]-at[i];
            ft[i]=st[i]+et[i];
            ta[i]=ft[i]-at[i];
        }
        else
        {
            st[i]=ft[i-1];
            wt[i]=st[i]-at[i];
            ft[i]=st[i]+et[i];
            ta[i]=ft[i]-at[i];
        }

        totwt+=wt[i];
        totta+=ta[i];
    }

    awt=(float)totwt/n;
    ata=(float)totta/n;

    printf("\nProcess name\tarrival time\texecution time\tpriority\twaiting time\tturn around time");

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

printf("\n%s\t\t%5d\t\t%5d\t\t%5d\t\t%5d\t\t%5d",pn[i],at[i],et[i],p[i],wt[i],ta[i]);

    printf("\nAverage waiting time is:%f", awt);
    printf("\nAverage turnaroundtime is:%f\n", ata);
    return 0;
}
```

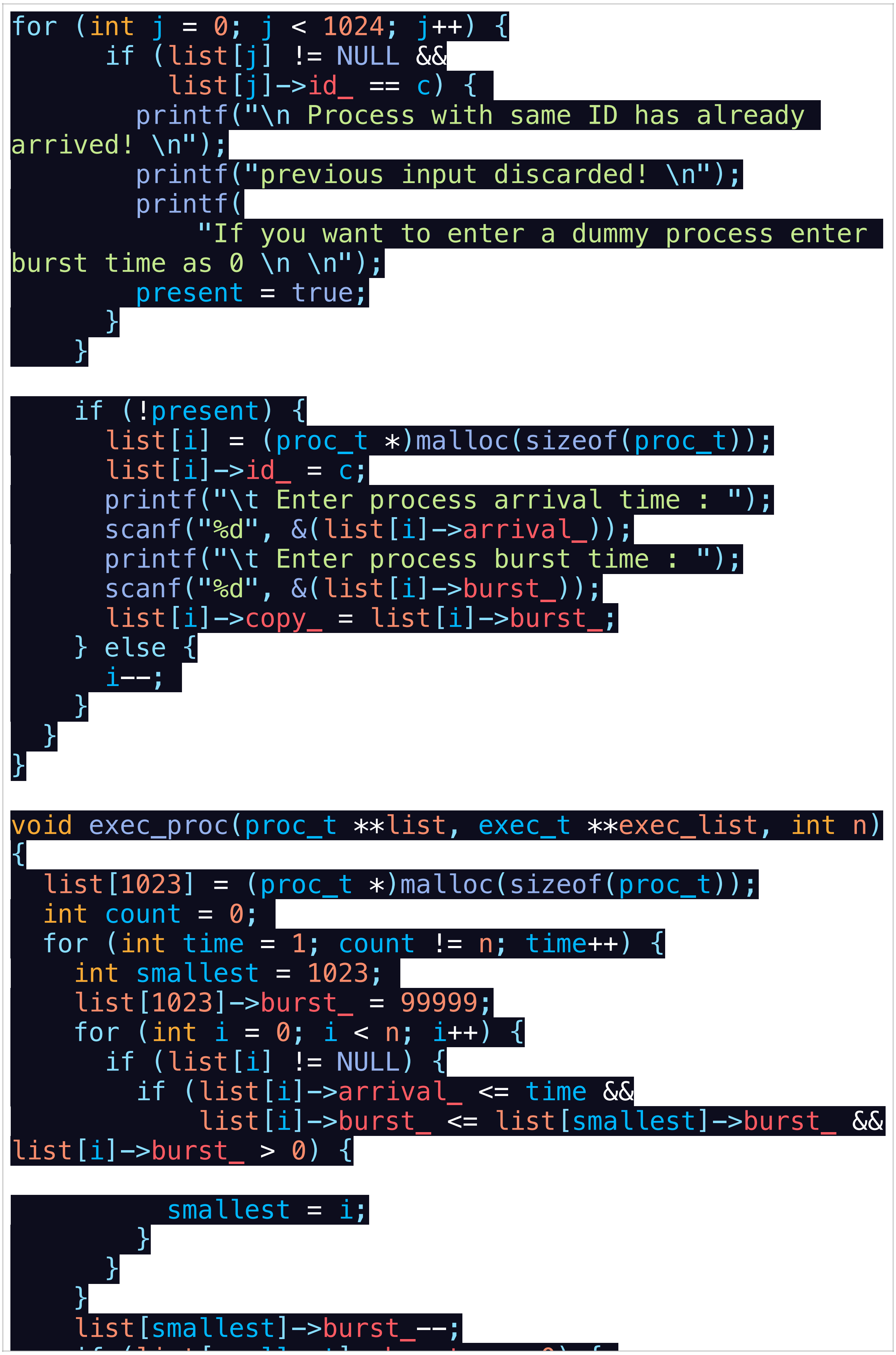
Output



```
[naman2341@Namans-MacBook-Pro Lab3 % gcc priority.c -o priority
[naman2341@Namans-MacBook-Pro Lab3 % ./priority
Enter the number of process:3
Enter process name,arrivaltime,execution time & priority:1 3 6 3
Enter process name,arrivaltime,execution time & priority:2 2 4 1
Enter process name,arrivaltime,execution time & priority:3 5 4 7

Process name    arrival time    execution time  priority        waiting time    turn around time
2                   2               4               1               0               4
1                   3               6               3               3               9
3                   5               4               7               7              11
Average waiting time is:3.333333
Average turnaroundtime is:8.000000
naman2341@Namans-MacBook-Pro Lab3 % 
```

Program Number	3
Program Qn	SJFP - Shortest Job first Preemptive
Code	

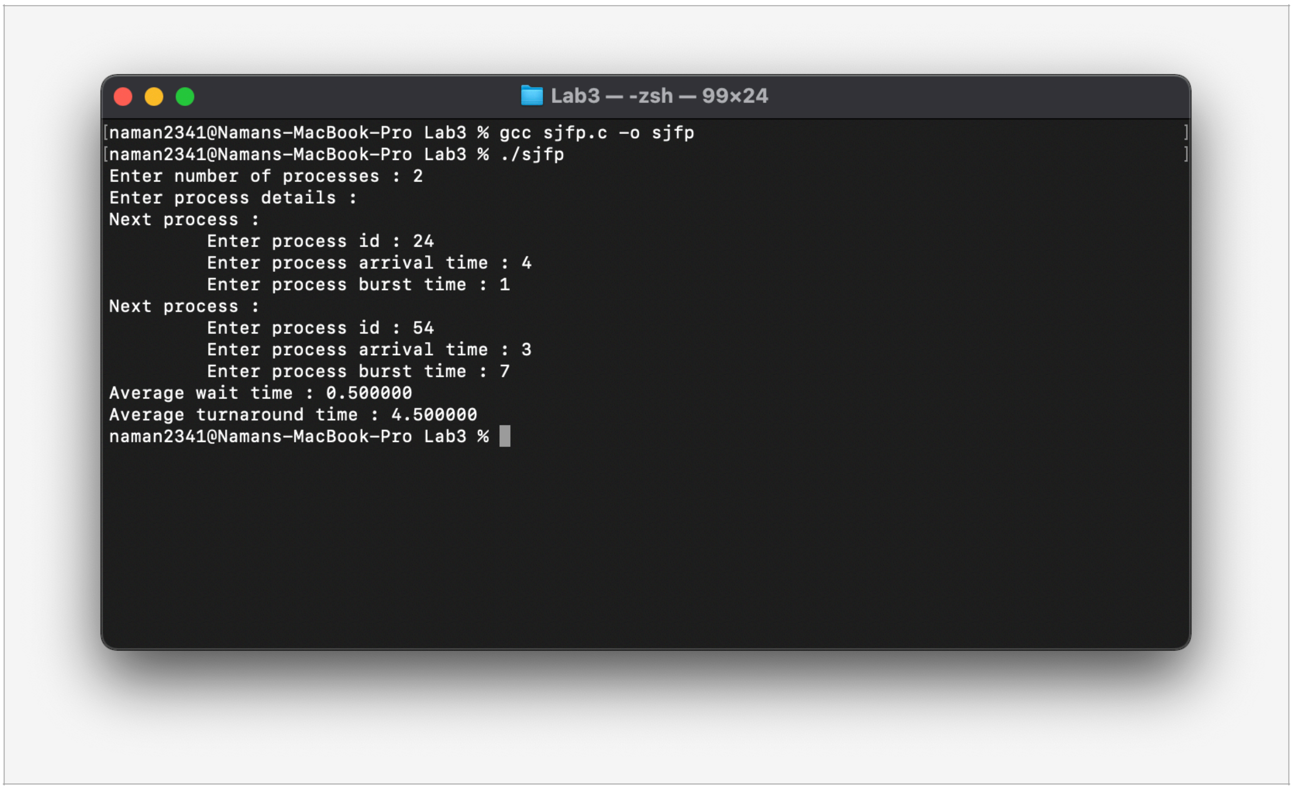
```c
#include <stdbool.h>
#include <stdio.h>
#include <stdlib.h>

struct proc {
  int id_;
  int burst_;
  int copy_;
  int arrival_;
};
struct executed {
  int wait_;
  int tat_;
  int end_;
};

typedef struct executed exec_t;
typedef struct proc proc_t;

void fetch_proc(proc_t **list, int n);
void exec_proc(proc_t **list, exec_t **exec_list, int
n);
void print(int n, exec_t **exec_list);

int main() {
  int n;
  printf("Enter number of processes : ");
  scanf("%d", &n);
  proc_t *list[1024] = {NULL};
  exec_t *exec_list[1024] = {NULL};
  fetch_proc(list, n);
  exec_proc(list, exec_list, n);
  print(n, exec_list);
  return 0;
}

void fetch_proc(proc_t **list, int n) {
  printf("Enter process details : \n");
  for (int i = 0; i < n; i++) {

    printf("Next process : \n");
    printf("\t Enter process id : ");
    int c;
    scanf("%d", &c);
    bool present = false;
    for (int i = 0; i < 1024; i++) {
```



```c
for (int j = 0; j < 1024; j++) {
      if (list[j] != NULL &&
          list[j]->id_ == c) {
        printf("\n Process with same ID has already 
arrived! \n");
        printf("previous input discarded! \n");
        printf(
            "If you want to enter a dummy process enter 
burst time as 0 \n \n");
        present = true;
      }
    }

    if (!present) {
      list[i] = (proc_t *)malloc(sizeof(proc_t));
      list[i]->id_ = c;
      printf("\t Enter process arrival time : ");
      scanf("%d", &(list[i]->arrival_));
      printf("\t Enter process burst time : ");
      scanf("%d", &(list[i]->burst_));
      list[i]->copy_ = list[i]->burst_;
    } else {
      i--;
    }
  }
}

void exec_proc(proc_t **list, exec_t **exec_list, int n)
{
  list[1023] = (proc_t *)malloc(sizeof(proc_t));
  int count = 0;
  for (int time = 1; count != n; time++) {
    int smallest = 1023;
    list[1023]->burst_ = 99999;
    for (int i = 0; i < n; i++) {
      if (list[i] != NULL) {
        if (list[i]->arrival_ <= time &&
            list[i]->burst_ <= list[smallest]->burst_ &&
list[i]->burst_ > 0) {

          smallest = i;
        }
      }
    }
    list[smallest]->burst_--;
    if (list[smallest]->burst_ == 0) {
```

```
if (list[smallest]->burst_ == 0) {
      count++;
      exec_list[smallest] = (exec_t
*)malloc(sizeof(exec_t));
      exec_list[smallest]->end_ = time + 1;
      exec_list[smallest]->wait_ = exec_list[smallest]-
>end_ -
                                   list[smallest]-
>arrival_ -
                                   list[smallest]-
>copy_;
      exec_list[smallest]->tat_ =
          exec_list[smallest]->end_ - list[smallest]-
>arrival_;
    }
  }
}

void print(int n, exec_t **exec_list) {
  double wait_sum = 0.0;
  double tat_sum = 0.0;
  for (int i = 0; exec_list[i] != NULL; i++) {
    wait_sum += exec_list[i]->wait_;
    tat_sum += exec_list[i]->tat_;
  }
  printf("Average wait time : %f \n", wait_sum / n);
  printf("Average turnaround time : %f \n", tat_sum / 
n);
}
```

Output



```
[naman2341@Namans-MacBook-Pro Lab3 % gcc sjfp.c -o sjfp
[naman2341@Namans-MacBook-Pro Lab3 % ./sjfp
Enter number of processes : 2
Enter process details :
Next process :
         Enter process id : 24
         Enter process arrival time : 4
         Enter process burst time : 1
Next process :
         Enter process id : 54
         Enter process arrival time : 3
         Enter process burst time : 7
Average wait time : 0.500000
Average turnaround time : 4.500000
naman2341@Namans-MacBook-Pro Lab3 %
```

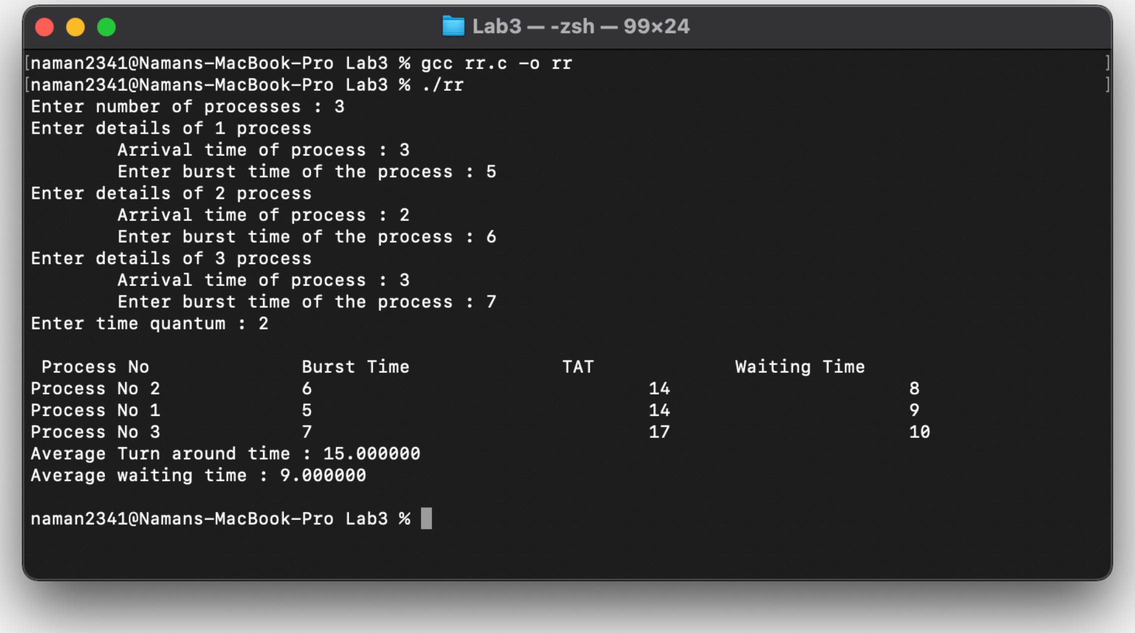
Program Number	4
Program Qn	RR - Round Robin Scheduling
Code	

```
// Program to show working of Preemptive Round Robin 
scheduling Algorithm

#include <stdio.h>
#include <stdlib.h>

struct proc {
  int id_;
  int arrival_;
  int burst_;
  int copy_;
  int end_;
};
typedef struct proc proc_t;

int main() {
  int n;
  printf("Enter number of processes : ");
  scanf("%d", &n);
  proc_t *proc_list[1024] = {NULL};
  for (int i = 0; i < n; i++) {
    proc_list[i] = (proc_t *)malloc(sizeof(proc_t));
    printf("Enter details of %d process \n", i + 1);
    printf("\tArrival time of process : ");
    scanf("%d", &(proc_list[i]->arrival_));
    printf("\tEnter burst time of the process : ");
    scanf("%d", &(proc_list[i]->burst_));
    proc_list[i]->copy_ = proc_list[i]->burst_;
    proc_list[i]->id_ = i + 1;
  }
  int quantum;
  printf("Enter time quantum : ");
  scanf("%d", &quantum);

  // sorting wtr to arrival time
  for (int i = 0; i < n - 1; i++) {
    for (int j = 0; j < n - i - 1; j++) {
      if (proc_list[j]->arrival_ > proc_list[j + 1]-
>arrival_) {
        proc_t *temp = proc_list[i];
        proc_list[i] = proc_list[i + 1];
        proc_list[i + 1] = temp;
      }
    }
  }
```

```
// unlike most algorithms, I'll actually move the jobs 
to the last
  int count = 0;
  int move_to = n;
  for (int time = 0; count < n;) {
    int fon = 0;
    for (int j = 0; j < move_to; j++) {
      if (proc_list[j]) {
        if (proc_list[j]->arrival_ <= time && 
proc_list[j]->burst_ > 0) {
          fon = 1;
          if (proc_list[j]->burst_ <= quantum) {
            time += proc_list[j]->burst_;
            proc_list[j]->burst_ = 0;
            proc_list[j]->end_ = time;
            count++;
          } else if (proc_list[j]->burst_ > 0) {
            proc_list[j]->burst_ -= quantum;
            time += quantum;
            proc_t *move = proc_list[j];
            proc_list[j] = NULL;
            proc_list[move_to] = move;
            move_to++;
          }
        }
      }
    }
    if (!fon)
      time++;
  }

  // printing all the stuff
  int tot_tat = 0, tot_wt = 0;
  printf("\n Process No \t\t Burst Time \t\t TAT \t\t 
Waiting Time ");
  for (int i = 0; i < move_to; i++) {
    if (proc_list[i]) {
      int tat = proc_list[i]->end_ - proc_list[i]-
>arrival_;
      int wt = tat - proc_list[i]->copy_;
      tot_tat += tat;
      tot_wt += wt;
      printf("\nProcess No %d \t\t %d\t\t\t\t %d\t\t\t\t 
%d", proc_list[i]->id_,
             proc_list[i]->copy_, tat, wt);
    }
```

```
 }
  }
  printf("\nAverage Turn around time : %f \n", tot_tat / (n + 0.0));
  printf("Average waiting time : %f \n", tot_wt / (n + 0.0));
  printf("\n");
}
```

Output



```
[naman2341@Namans-MacBook-Pro Lab3 % gcc rr.c -o rr
[naman2341@Namans-MacBook-Pro Lab3 % ./rr
Enter number of processes : 3
Enter details of 1 process
        Arrival time of process : 3
        Enter burst time of the process : 5
Enter details of 2 process
        Arrival time of process : 2
        Enter burst time of the process : 6
Enter details of 3 process
        Arrival time of process : 3
        Enter burst time of the process : 7
Enter time quantum : 2

 Process No              Burst Time              TAT             Waiting Time
Process No 2             6                               14                      8
Process No 1             5                               14                      9
Process No 3             7                               17                      10
Average Turn around time : 15.000000
Average waiting time : 9.000000

naman2341@Namans-MacBook-Pro Lab3 % 
```