S.No: 1	Exp. Name: *Implementation of the Round Robin cpu scheduling algorithm*	Date:

Aim:

Write a program to implement the Round Robin CPU scheduling algorithm.

The steps to be followed in Round Robin:

```
1- The queue structure in ready queue is of First In First Out (FIFO) type.
2- A fixed time is allotted to every process that arrives in the queue. This fixed tim
e is known as time slice or time quantum.
3- The first process that arrives is selected and sent to the processor for execution.
If it is not able to complete its execution within the time quantum provided, then an
 interrupt is generated using an automated timer.
4- The process is then stopped and is sent back at the end of the queue. However, the
 state is saved and context is thereby stored in memory. This helps the process to res
ume from the point where it was interrupted.
5- The scheduler selects another process from the ready queue and dispatches it to the
processor for its execution. It is executed until the time Quantum does not exceed.
6- The same steps are repeated until all the process are finished.
```

Different formulas to be calculated in Round Robin:

```
1- Completion Time: Time at which process completes its execution.
2- Turn Around Time: Time Difference between completion time and arrival time. Turn Ar
ound Time = Completion Time - Arrival Time
3- Waiting Time(W.T): Time Difference between turn around time and burst time. Waiting
Time = Turn Around Time - Burst Time
```

Sample Input and Output:

```
Enter total process : 4
Enter arrival time and burst time for process number - 1 : 0 9
Enter arrival time and burst time for process number - 2 : 1 5
Enter arrival time and burst time for process number - 3 : 2 3
Enter arrival time and burst time for process number - 4 : 3 4
Enter time quantum : 5
Process Turnaround time Waiting time
p[2]          9                4
p[3]          11               8
p[4]          14               10
p[1]          21               12
Average waiting time = 8.500000
Average turnaround time = 13.750000
```

Source Code:

RoundRobin1.c

```c
#include<stdio.h>
int main()
{
  int i,limit,total=0,x,counter=0,time_quantum,wait_time=0,turnaround_time=0,arrival_ti
me[10],burst_time[10],temp[10];
  float average_wait_time,average_turnaround_time;
  printf("Enter total process : ");
  scanf("%d",&limit);
  x=limit;
```

ID: 18BF1A0531   Page No:

SV College of Engineering

```
for(i=0;i<limit;i++)
{
    printf("Enter arrival time and burst time for process number - %d : ", i + 1);
    scanf("%d%d", &arrival_time[i], &burst_time[i]);
    temp[i] = burst_time[i];
}
printf("Enter time quantum : ");
scanf("%d", &time_quantum);
printf("Process\tTurnaround time\tWaiting time");
for(total = 0, i = 0; x != 0;)
{
    if(temp[i] <= time_quantum && temp[i] > 0)
    {
        total = total + temp[i];
        temp[i] = 0;
        counter = 1;
    }
    else if(temp[i] > 0)
    {
        temp[i] = temp[i] - time_quantum;
        total = total + time_quantum;
    }
    if(temp[i] == 0 && counter == 1)
    {
        x--;
        printf("\np[%d]\t\t%d\t\t%d", i + 1, total - arrival_time[i], total - arrival_tim
e[i] - burst_time[i],burst_time[i]);
        wait_time = wait_time + total - arrival_time[i] - burst_time[i];
        turnaround_time = turnaround_time + total - arrival_time[i];
        counter = 0;
    }
    if(i == limit - 1)
    {
        i = 0;
    }
    else if(arrival_time[i + 1] <= total)
    {
        i++;
    }
    else
    {
        i = 0;
    }
}
average_wait_time = wait_time * 1.0 / limit;
average_turnaround_time = turnaround_time * 1.0 / limit;
printf("\nAverage waiting time = %f", average_wait_time);
printf("\nAverage turnaround time = %f\n", average_turnaround_time);
return 0;
}
```

Execution Results - All test cases have succeeded!

Test Case - 1

Test Case - 1

User Output

Enter total process : 4
Enter arrival time and burst time for process number - 1 : 0 9
Enter arrival time and burst time for process number - 2 : 1 5
Enter arrival time and burst time for process number - 3 : 2 3
Enter arrival time and burst time for process number - 4 : 3 4
Enter time quantum : 5
Process Turnaround time Waiting time

p[2]	9	4
p[3]	11	8
p[4]	14	10
p[1]	21	12

Average waiting time = 8.500000
Average turnaround time = 13.750000

Test Case - 2

User Output

Enter total process : 5
Enter arrival time and burst time for process number - 1 : 0 5
Enter arrival time and burst time for process number - 2 : 1 3
Enter arrival time and burst time for process number - 3 : 2 1
Enter arrival time and burst time for process number - 4 : 3 2
Enter arrival time and burst time for process number - 5 : 4 3
Enter time quantum : 2
Process Turnaround time Waiting time

p[3]	3	2
p[4]	4	2
p[2]	11	8
p[5]	9	6
p[1]	14	9

Average waiting time = 5.400000
Average turnaround time = 8.200000

Test Case - 3

User Output

Enter total process : 6
Enter arrival time and burst time for process number - 1 : 0 4
Enter arrival time and burst time for process number - 2 : 1 5
Enter arrival time and burst time for process number - 3 : 2 2
Enter arrival time and burst time for process number - 4 : 3 1
Enter arrival time and burst time for process number - 5 : 4 6
Enter arrival time and burst time for process number - 6 : 5 3
Enter time quantum : 2
Process Turnaround time Waiting time

p[3]	4	2
p[4]	4	3
p[1]	13	9
p[6]	13	10
p[2]	18	13
p[5]	17	11

Test Case - 3

| Average waiting time = 8.000000 |
| Average turnaround time = 11.500000 |

Test Case - 4

User Output

| Enter total process : 4 |
| Enter arrival time and burst time for process number - 1 : 0 10 |
| Enter arrival time and burst time for process number - 2 : 1 4 |
| Enter arrival time and burst time for process number - 3 : 2 5 |
| Enter arrival time and burst time for process number - 4 : 3 3 |
| Enter time quantum : 3 |

Process	Turnaround time	Waiting time
p[4]	9	6
p[2]	15	11
p[3]	16	11
p[1]	22	12

| Average waiting time = 10.000000 |
| Average turnaround time = 15.500000 |

Test Case - 5

User Output

| Enter total process : 3 |
| Enter arrival time and burst time for process number - 1 : 0 3 |
| Enter arrival time and burst time for process number - 2 : 1 4 |
| Enter arrival time and burst time for process number - 3 : 2 3 |
| Enter time quantum : 1 |

Process	Turnaround time	Waiting time
p[1]	7	4
p[3]	7	4
p[2]	9	5

| Average waiting time = 4.333333 |
| Average turnaround time = 7.666667 |

Test Case - 6

User Output

| Enter total process : 4 |
| Enter arrival time and burst time for process number - 1 : 0 5 |
| Enter arrival time and burst time for process number - 2 : 1 3 |
| Enter arrival time and burst time for process number - 3 : 2 8 |
| Enter arrival time and burst time for process number - 4 : 3 6 |
| Enter time quantum : 3 |

Process	Turnaround time	Waiting time
p[2]	5	2
p[1]	14	9
p[4]	17	11
p[3]	20	12

| Average waiting time = 8.500000 |
| Average turnaround time = 14.000000 |