OS LAB 2

AIM: Write a C program to simulate the following CPU scheduling algorithm to find turnaround time and waiting time.

1. Priority (pre-emptive & Non-pre-emptive)
2. Round Robin (Experiment with different quantum sizes for RR algorithm)

SOURCE CODE

```
#include<stdio.h>
void findWaitingTime(int processes[], int n, int burstTime[], int priority[], int waitingTime[])
{
   int remainingTime[n];
   for (int i = 0; i < n; i++)
      remainingTime[i] = burstTime[i];

   int completed = 0;
   int currentTime = 0;

   while (completed != n)
   {
      int highestPriorityIndex = -1;
      int highestPriority = -1;

      for (int i = 0; i < n; i++)
      {
         if (remainingTime[i] > 0 && priority[i] > highestPriority)
         {
            highestPriority = priority[i];
            highestPriorityIndex = i;
         }
      }
```

```
        if (highestPriorityIndex == -1)
        {
            currentTime++;
            continue;
        }

        remainingTime[highestPriorityIndex]--;

        if (remainingTime[highestPriorityIndex] == 0)
        {
            completed++;

            waitingTime[highestPriorityIndex] = currentTime + 1 - burstTime[highestPriorityIndex];

            if (waitingTime[highestPriorityIndex] < 0)
                waitingTime[highestPriorityIndex] = 0;
        }

        currentTime++;
    }
}

void findTurnaroundTime(int processes[], int n, int burstTime[], int waitingTime[], int
turnaroundTime[])
{
    for (int i = 0; i < n; i++)
        turnaroundTime[i] = burstTime[i] + waitingTime[i];
}

void findAverageTime(int processes[], int n, int burstTime[], int priority[])
{
```

```
    int waitingTime[n], turnaroundTime[n], totalWaitingTime = 0, totalTurnaroundTime = 0;

    findWaitingTime(processes, n, burstTime, priority, waitingTime);

    findTurnaroundTime(processes, n, burstTime, waitingTime, turnaroundTime);

    printf("\nProcess\tBurst Time\tPriority\tWaiting Time\tTurnaround Time\n");

    for (int i = 0; i < n; i++)
    {
        totalWaitingTime += waitingTime[i];
        totalTurnaroundTime += turnaroundTime[i];
        printf("%d\t%d\t\t%d\t\t%d\t\t%d\n", processes[i], burstTime[i], priority[i], waitingTime[i],
turnaroundTime[i]);
    }

    printf("\nAverage Waiting Time: %.2f", (float)totalWaitingTime / n);
    printf("\nAverage Turnaround Time: %.2f", (float)totalTurnaroundTime / n);
}

void priorityNonPreemptiveScheduling(int processes[], int n, int burstTime[], int priority[])
{
    for (int i = 0; i < n - 1; i++)
    {
        for (int j = 0; j < n - i - 1; j++)
        {
            if (priority[j] > priority[j + 1])
            {
                int temp = priority[j];
                priority[j] = priority[j + 1];
                priority[j + 1] = temp;
```

```
            temp = burstTime[j];
            burstTime[j] = burstTime[j + 1];
            burstTime[j + 1] = temp;

            temp = processes[j];
            processes[j] = processes[j + 1];
            processes[j + 1] = temp;
          }
        }
    }

    printf("\nPriority Non-Preemptive Scheduling:\n");
    findAverageTime(processes, n, burstTime, priority);
}

void priorityPreemptiveScheduling(int processes[], int n, int burstTime[], int priority[])
{
    int remainingTime[n];
    for (int i = 0; i < n; i++)
        remainingTime[i] = burstTime[i];

    int completed = 0;
    int currentTime = 0;

    while (completed != n)
    {
        int highestPriorityIndex = -1;
        int highestPriority = -1;

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

```
    {
        if (remainingTime[i] > 0 && priority[i] > highestPriority)
        {
            highestPriority = priority[i];
            highestPriorityIndex = i;
        }
    }

    if (highestPriorityIndex == -1)
    {
        currentTime++;
        continue;
    }

    remainingTime[highestPriorityIndex]--;

    if (remainingTime[highestPriorityIndex] == 0)
    {
        completed++;

        int finishTime = currentTime + 1;

        int waitingTime = finishTime - burstTime[highestPriorityIndex];

        if (waitingTime < 0)
            waitingTime = 0;

        printf("Process %d:\n", processes[highestPriorityIndex]);
        printf("Waiting Time: %d\n", waitingTime);
        printf("Turnaround Time: %d\n", finishTime);
    }
```

```
        currentTime++;
    }
}

void roundRobinScheduling(int processes[], int n, int burstTime[], int quantum)
{
    int remainingTime[n];
    for (int i = 0; i < n; i++)
        remainingTime[i] = burstTime[i];

    int completed = 0;
    int currentTime = 0;

    while (completed != n)
    {
        for (int i = 0; i < n; i++)
        {
            if (remainingTime[i] > 0)
            {
                if (remainingTime[i] <= quantum)
                {
                    currentTime += remainingTime[i];
                    remainingTime[i] = 0;
                    completed++;

                    printf("Process %d:\n", processes[i]);
                    printf("Waiting Time: %d\n", currentTime - burstTime[i]);
                    printf("Turnaround Time: %d\n", currentTime);
                }
                else
```

```
            {
                currentTime += quantum;
                remainingTime[i] -= quantum;
            }
        }
    }
}

int main()
{
    int n, choice;
    printf("Enter the number of processes: ");
    scanf("%d", &n);

    int processes[n], burstTime[n], priority[n];

    printf("Choose the scheduling algorithm:\n");
    printf("1. Priority Non-Preemptive\n");
    printf("2. Priority Preemptive\n");
    printf("3. Round Robin\n");
    printf("Enter your choice: ");
    scanf("%d", &choice);

    switch (choice)
    {
        case 1:
            for (int i = 0; i < n; i++)
            {
                printf("Enter burst time for process %d: ", i + 1);
                scanf("%d", &burstTime[i]);
```

```
            printf("Enter priority for process %d: ", i + 1);
            scanf("%d", &priority[i]);
            processes[i] = i + 1;
        }
        priorityNonPreemptiveScheduling(processes, n, burstTime, priority);
        break;

    case 2:
        for (int i = 0; i < n; i++)
        {
            printf("Enter burst time for process %d: ", i + 1);
            scanf("%d", &burstTime[i]);
            printf("Enter priority for process %d: ", i + 1);
            scanf("%d", &priority[i]);
            processes[i] = i + 1;
        }
        priorityPreemptiveScheduling(processes, n, burstTime, priority);
        break;

    case 3:
        {
            int quantum;
            printf("Enter the time quantum for Round Robin: ");
            scanf("%d", &quantum);
            for (int i = 0; i < n; i++)
            {
                printf("Enter burst time for process %d: ", i + 1);
                scanf("%d", &burstTime[i]);
                processes[i] = i + 1;
            }
            roundRobinScheduling(processes, n, burstTime, quantum);
```

```
            }
            break;

        default:
            printf("Invalid choice. Exiting...\n");
            return 0;
    }

    return 0;
}
```

OUTPUT SCREENSHOTS

```
PS C:\Users\jiten\Desktop\OS> cd "c:\Users\jiten\Desktop\OS\" ; if ($?) { gcc Priority_RoundRobin.c -o Priority_RoundRobin } ; if ($?) { .\Priority_Roun
dRobin }
Enter the number of processes: 4
Choose the scheduling algorithm:
1. Priority Non-Preemptive
2. Priority Preemptive
3. Round Robin
Enter your choice: 2
Enter burst time for process 1: 16
Enter priority for process 1: 5
Enter burst time for process 2: 12
Enter priority for process 2: 4
Enter burst time for process 3: 17
Enter priority for process 3: 6
Enter burst time for process 4: 5
Enter priority for process 4: 2
Process 3:
Waiting Time: 0
Turnaround Time: 17
Process 1:
Waiting Time: 17
Turnaround Time: 33
Process 2:
Waiting Time: 33
Turnaround Time: 45
Process 4:
Waiting Time: 45
Turnaround Time: 50
PS C:\Users\jiten\Desktop\OS>
```

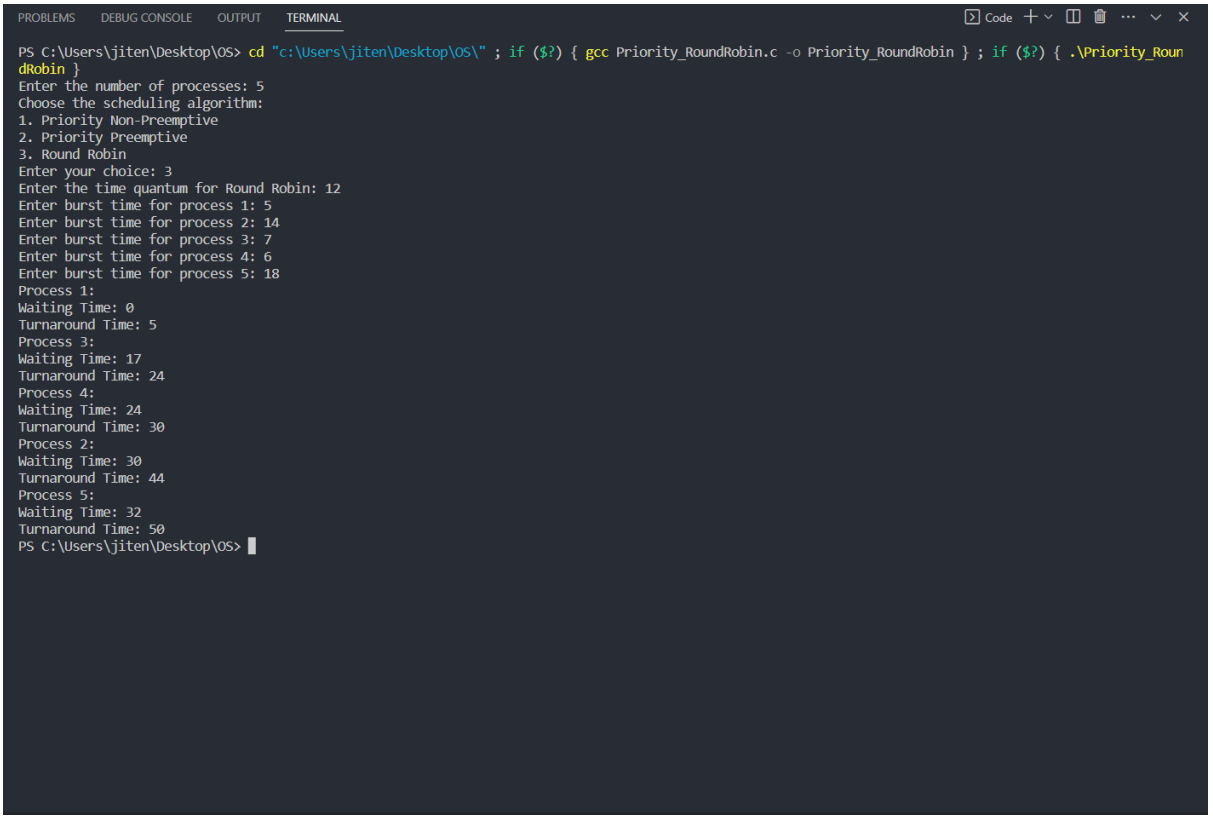
PROBLEMS DEBUG CONSOLE OUTPUT TERMINAL Code

```
PS C:\Users\jiten\Desktop\OS> cd "c:\Users\jiten\Desktop\OS\" ; if ($?) { gcc Priority_RoundRobin.c -o Priority_RoundRobin } ; if ($?) { .\Priority_Roun
dRobin }
Enter the number of processes: 5
Choose the scheduling algorithm:
1. Priority Non-Preemptive
2. Priority Preemptive
3. Round Robin
Enter your choice: 1
Enter burst time for process 1: 12
Enter priority for process 1: 2
Enter burst time for process 2: 16
Enter priority for process 2: 5
Enter burst time for process 3: 8
Enter priority for process 3: 3
Enter burst time for process 4: 6
Enter priority for process 4: 1
Enter burst time for process 5: 18
Enter priority for process 5: 7

Priority Non-Preemptive Scheduling:

Process Burst Time      Priority        Waiting Time    Turnaround Time
4       6               1               54              60
1       12              2               42              54
3       8               3               34              42
2       16              5               18              34
5       18              7               0               18

Average Waiting Time: 29.60
Average Turnaround Time: 41.60
PS C:\Users\jiten\Desktop\OS>
```


PROBLEMS
DEBUG CONSOLE
OUTPUT
TERMINAL
Code
PS C:\Users\jiten\Desktop\OS> cd "c:\Users\jiten\Desktop\OS\" ; if ($?) { gcc Priority_RoundRobin.c -o Priority_RoundRobin } ; if ($?) { .\Priority_RoundRobin }
Enter the number of processes: 5
Choose the scheduling algorithm:
1. Priority Non-Preemptive
2. Priority Preemptive
3. Round Robin
Enter your choice: 3
Enter the time quantum for Round Robin: 12
Enter burst time for process 1: 5
Enter burst time for process 2: 14
Enter burst time for process 3: 7
Enter burst time for process 4: 6
Enter burst time for process 5: 18
Process 1:
Waiting Time: 0
Turnaround Time: 5
Process 3:
Waiting Time: 17
Turnaround Time: 24
Process 4:
Waiting Time: 24
Turnaround Time: 30
Process 2:
Waiting Time: 30
Turnaround Time: 44
Process 5:
Waiting Time: 32
Turnaround Time: 50
PS C:\Users\jiten\Desktop\OS>