Fr. Conceicao Rodrigues College of Engineering Department of Computer Engineering			
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Date of Performance		**SE Computer – Div**	**A**

Aim: Study Process Scheduling

Lab Outcome:

CSL403.2: Implement various Process scheduling algorithm and evaluate their performance.

Problem Statements:
Batch (A): First Come First Serve (FCFS) ,Non Preemptive Shortest Job First (SJF)

Batch (B): Non Preemptive Shortest Job First (SJF) ,Shortest Remaining Time First (SRTF)

Batch (C): Round Robin Algorithm (RR), Non Preemptive Priority (NPP)

Batch (D): Non Preemptive Priority (NPP), Premptive Priority (PP)

1. Calculate WT, AWT, TAT, ATAT.

2. Compare the result of algorithms for a problem and find which algorithm is performing better.

References:

https://www.geeksforgeeks.org/cpu-scheduling-in-operating-systems/?ref=lbp

On time Submission(2)	**Knowledge of Topic(4)**	**Implementation and Demonstraion(4)**	**Total (10)**
Signature of Faculty		**Date of Submission**	

Batch-C

1.Round robin algorithm:-

```
emp_list = [
    {"employee": {"arrival_time": 0, "burst_time": 10,
"completion_time": -1, "turn_around_time": -1}},
    {"employee": {"arrival_time": 2, "burst_time": 5,
"completion_time": -1, "turn_around_time": -1}},
    {"employee": {"arrival_time": 1, "burst_time": 8,
"completion_time": -1, "turn_around_time": -1}}
]


time_quantum = 2  # Time quantum for Round Robin
completed_list = []


current_time = 0
while emp_list:
    for emp in emp_list:
        if emp["employee"]["burst_time"] > 0:
            if emp["employee"]["burst_time"] > time_quantum:
                current_time += time_quantum
                emp["employee"]["burst_time"] -= time_quantum
            else:
                current_time += emp["employee"]["burst_time"]  # Use
remaining burst time
                emp["employee"]["completion_time"] = current_time
                emp["employee"]["turn_around_time"] =
emp["employee"]["completion_time"] - emp["employee"]["arrival_time"]
                emp["employee"]["burst_time"] = 0
                completed_list.append(emp)
                emp_list.remove(emp)
```

```
                break  # Move to the next employee once the current one
is completed


# Calculate AWT and ATAT
total_waiting_time = 0
total_turnaround_time = 0

for emp in completed_list:
    total_waiting_time += emp["employee"]["turn_around_time"] -
emp["employee"]["burst_time"]
    total_turnaround_time += emp["employee"]["turn_around_time"]

# Calculate averages
total_employees = len(completed_list)
average_waiting_time = total_waiting_time / total_employees
average_turnaround_time = total_turnaround_time / total_employees

# Print completion times
for emp in completed_list:
    print("Arrival time:", emp["employee"]["arrival_time"], "Completion
time:", emp["employee"]["completion_time"])

# Print AWT and ATAT
print("Average Waiting Time (AWT):", average_waiting_time)
print("Average Turnaround Time (ATAT):", average_turnaround_time)
print("Completed List:", completed_list)
```

```
PS C:\Users\Mark Lopes\Desktop\college\Sem_4\Os> python -u "c:\Users\Mark Lopes\Desktop\college\Sem_4\Os\lab4\os_exp4_round_robin.py"
Arrival time: 2 Completion time: 15
Arrival time: 0 Completion time: 21
Arrival time: 1 Completion time: 23
Average Waiting Time (AWT): 18.666666666666668
Average Turnaround Time (ATAT): 18.666666666666668
Completed List: [{'employee': {'arrival_time': 2, 'burst_time': 0, 'completion_time': 15, 'turn_around_time': 13}}, {'employee': {'arrival_time': 0, 'burst_time
': 0, 'completion_time': 21, 'turn_around_time': 21}}, {'employee': {'arrival_time': 1, 'burst_time': 0, 'completion_time': 23, 'turn_around_time': 22}}]
PS C:\Users\Mark Lopes\Desktop\college\Sem_4\Os>
```

Non-Preemptive priority:-

```c
#include <stdio.h>


struct Employee

{

    int id;

    char name[50];

    int rank;

    int arrivalTime;

    int burstTime;

    int waitingTime;

    int turnaroundTime;

    int completionTime; // New field to store completion time

};


void sortEmployeesByArrivalTime(struct Employee employees[], int n)

{

    struct Employee temp;

    for (int i = 0; i < n - 1; i++)

    {

        for (int j = 0; j < n - i - 1; j++)

        {

            // If arrival times are same, compare ranks
```

```
            if (employees[j].arrivalTime == employees[j +
1].arrivalTime)
            {
                if (employees[j].rank > employees[j + 1].rank)
                {
                    temp = employees[j];
                    employees[j] = employees[j + 1];
                    employees[j + 1] = temp;
                }
            }
            // Otherwise, sort based on arrival time
            else if (employees[j].arrivalTime > employees[j +
1].arrivalTime)
            {
                temp = employees[j];
                employees[j] = employees[j + 1];
                employees[j + 1] = temp;
            }
        }
    }
}

void calculateTimes(struct Employee employees[], int n)
{
    employees[0].waitingTime = 0;
    employees[0].turnaroundTime = employees[0].burstTime;
    employees[0].completionTime = employees[0].turnaroundTime +
employees[0].arrivalTime;

    for (int i = 1; i < n; i++)
```

```
    {
        employees[i].waitingTime = employees[i - 1].completionTime > employees[i].arrivalTime ? employees[i - 1].completionTime - employees[i].arrivalTime : 0;
        employees[i].turnaroundTime = employees[i].waitingTime + employees[i].burstTime;
        employees[i].completionTime = employees[i].turnaroundTime + employees[i].arrivalTime;
    }
}

void displayMeetingSchedule(struct Employee employees[], int n)
{
    printf("\nMeeting Schedule:\n");
    printf("Employee\tRank\tArrival Time\tBurst Time\tWaiting Time\tTurnaround Time\tCompletion Time\n");
    for (int i = 0; i < n; i++)
    {
        printf("%s\t\t%d\t%d\t\t%d\t\t%d\t\t%d\t\t\t%d\n", employees[i].name, employees[i].rank,
               employees[i].arrivalTime, employees[i].burstTime, employees[i].waitingTime,
               employees[i].turnaroundTime, employees[i].completionTime);
    }
}

int main(void)
{
    int n;

    printf("Enter the number of employees in the meeting: ");
```

```
    scanf("%d", &n);

    struct Employee employees[n];

    for (int i = 0; i < n; i++)
    {
        employees[i].id = i + 1;
        printf("Enter the name of Employee %d: ", i + 1);
        scanf("%s", employees[i].name);
        printf("Enter the rank (priority) for Employee %d: ", i + 1);
        scanf("%d", &employees[i].rank);
        printf("Enter the arrival time for Employee %d: ", i + 1);
        scanf("%d", &employees[i].arrivalTime);
        printf("Enter the burst time (time taken for presentation) for
Employee %d: ", i + 1);
        scanf("%d", &employees[i].burstTime);
    }

    // Sort employees by arrival time
    sortEmployeesByArrivalTime(employees, n);

    // Calculate waiting time, turnaround time, and completion time
    calculateTimes(employees, n);

    // Display meeting schedule
    displayMeetingSchedule(employees, n);

    // Calculate averages
    float totalWaitingTime = 0;
```

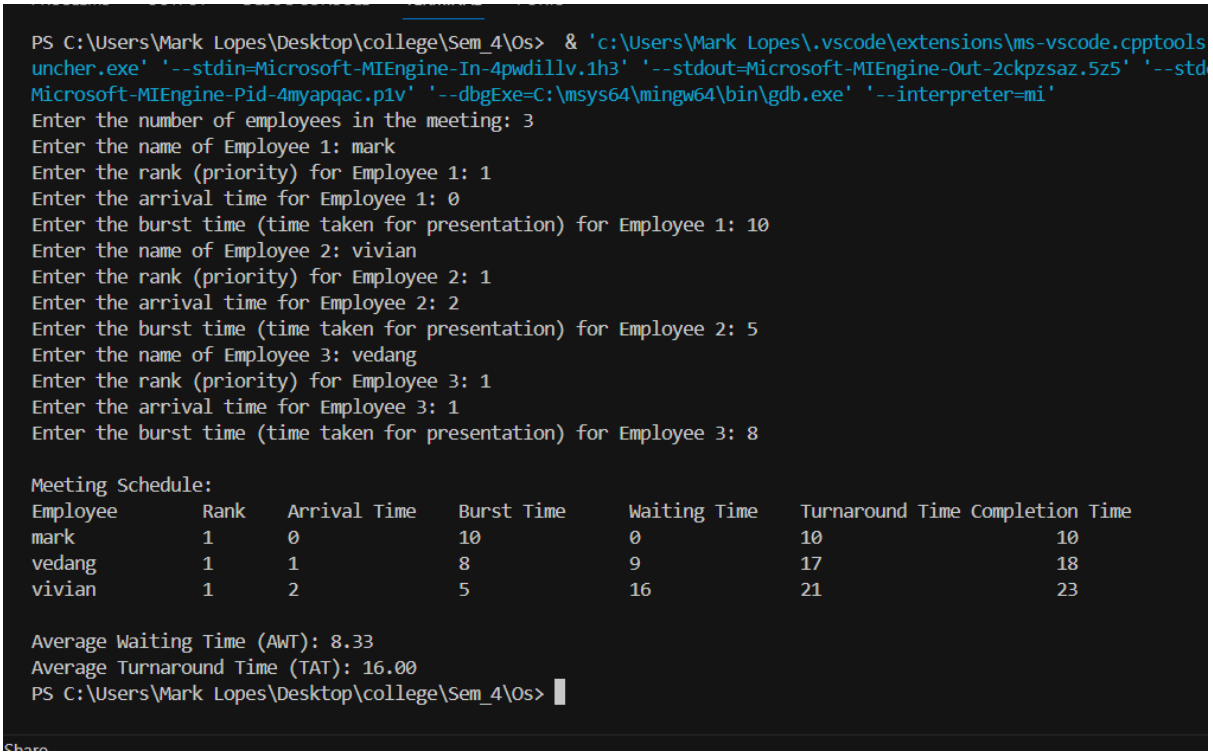
```
    float totalTurnaroundTime = 0;

    for (int i = 0; i < n; i++)
    {
        totalWaitingTime += employees[i].waitingTime;
        totalTurnaroundTime += employees[i].turnaroundTime;
    }

    float averageWaitingTime = totalWaitingTime / n;
    float averageTurnaroundTime = totalTurnaroundTime / n;

    // Print averages
    printf("\nAverage Waiting Time (AWT): %.2f\n", averageWaitingTime);
    printf("Average Turnaround Time (TAT): %.2f\n",
averageTurnaroundTime);

    return 0;
}
```



As we see in the above results, the AWT and ATAT for non-preemptive priority scheduling algorithm is lower than that for round robin.

Therefore in our case for non-preemptive priority scheduling algorithm is better