Academic Year: 2023-24 Sem: III

Sub: Operating Systems Laboratory SAP ID: 60003220131

EXPERIMENT NO. 02

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BATCH: 1

```c
#include <stdio.h>

void calculateWaitingTime(int processes[], int n, int burst_time[], int
waiting_time[])
{
    waiting_time[0] = 0; // Waiting time for the first process is 0

    for (int i = 1; i < n; i++)
    {
        waiting_time[i] = burst_time[i - 1] + waiting_time[i - 1];
    }
}

void calculateTurnaroundTime(int processes[], int n, int burst_time[], int
waiting_time[], int turnaround_time[])
{
    for (int i = 0; i < n; i++)
    {
        turnaround_time[i] = burst_time[i] + waiting_time[i];
    }
}

void displayGanttChart(int processes[], int n, int burst_time[])
{
    printf("\nGantt Chart:\n");

    for (int i = 0; i < n; i++)
    {
        printf("| P%d ", processes[i]);
    }
    printf("|\n");

    int current_time = 0;
    for (int i = 0; i < n; i++)
    {
        printf("%d\t", current_time);
        current_time += burst_time[i];
    }
```

```
    printf("%d\n", current_time);
}

void calculateAverageWaitingTime(int processes[], int n, int burst_time[], int
waiting_time[])
{
    float total_waiting_time = 0;

    for (int i = 0; i < n; i++)
    {
        total_waiting_time += waiting_time[i];
    }

    float avg_waiting_time = total_waiting_time / n;
    printf("Average Waiting Time: %.2f\n", avg_waiting_time);
}

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

    int processes[n], burst_time[n], waiting_time[n], turnaround_time[n];

    for (int i = 0; i < n; i++)
    {
        printf("Enter burst time for process P%d: ", i + 1);
        scanf("%d", &burst_time[i]);
        processes[i] = i + 1;
    }

    calculateWaitingTime(processes, n, burst_time, waiting_time);
    calculateTurnaroundTime(processes, n, burst_time, waiting_time,
turnaround_time);

    printf("\nProcess\tBurst Time\tWaiting Time\tTurnaround Time\n");
    for (int i = 0; i < n; i++)
    {
        printf("%d\t%d\t\t%d\t\t%d\n", processes[i], burst_time[i],
waiting_time[i], turnaround_time[i]);
    }

    displayGanttChart(processes, n, burst_time);

    calculateAverageWaitingTime(processes, n, burst_time, waiting_time);
```

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```
    return 0;
}
```

Q2

```
#include <stdio.h>

struct Process
{
    int id;
    int arrival_time;
    int burst_time;
    int priority;
    int waiting_time;
    int turnaround_time;
};

void sjf_with_priority(struct Process processes[], int n)
{
    int total_waiting_time = 0;
    int total_turnaround_time = 0;

    for (int i = 0; i < n; i++)
    {
        for (int j = i + 1; j < n; j++)
        {
            if (processes[i].arrival_time > processes[j].arrival_time ||
(processes[i].arrival_time == processes[j].arrival_time &&
                                                                (pro
cesses[i].priority > processes[j].priority ||
                                                                 (pr
ocesses[i].priority == processes[j].priority && processes[i].burst_time >
processes[j].burst_time))))
            {
                struct Process temp = processes[i];
                processes[i] = processes[j];
                processes[j] = temp;
            }
        }
    }

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

```
        if (processes[i].arrival_time > current_time)
        {
            current_time = processes[i].arrival_time;
        }

        processes[i].waiting_time = current_time - processes[i].arrival_time;
        processes[i].turnaround_time = processes[i].waiting_time +
processes[i].burst_time;

        total_waiting_time += processes[i].waiting_time;
        total_turnaround_time += processes[i].turnaround_time;

        current_time += processes[i].burst_time;
    }

    printf("\nGantt Chart:\n");
    printf("0");
    for (int i = 0; i < n; i++)
    {
        printf("->P%d->%d", processes[i].id, current_time);
    }

    printf("\n\nTABLE\n");
    printf("Process AT BT WT TAT\n");
    for (int i = 0; i < n; i++)
    {
        printf("P%d\t%d\t%d\t%d\t%d\n", processes[i].id,
processes[i].arrival_time, processes[i].burst_time, processes[i].waiting_time,
processes[i].turnaround_time);
    }

    double avg_waiting_time = (double)total_waiting_time / n;
    double avg_turnaround_time = (double)total_turnaround_time / n;

    printf("\nAverage Turnaround Time: %.6lf\n", avg_turnaround_time);
    printf("Average Waiting Time: %.6lf\n", avg_waiting_time);
}

int main()
{
    int n;

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

    struct Process processes[n];
```

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```
    for (int i = 0; i < n; i++)
    {
        processes[i].id = i + 1;
        printf("Enter the arrival time for process P%d: ", i + 1);
        scanf("%d", &processes[i].arrival_time);
        printf("Enter the burst time for process P%d: ", i + 1);
        scanf("%d", &processes[i].burst_time);
        printf("Enter the priority for process P%d: ", i + 1);
        scanf("%d", &processes[i].priority);
    }

    sjf_with_priority(processes, n);

    return 0;
}
```

Q3

```
#include <stdio.h>

void priorityScheduling(int processes[], int n, int burst_time[], int
priority[], int arrival_time[])
{
    int waiting_time[n], turnaround_time[n];

    for (int i = 0; i < n - 1; i++)
    {
        for (int j = 0; j < n - i - 1; j++)
        {
            if (arrival_time[j] > arrival_time[j + 1])
            {
                int temp = arrival_time[j];
                arrival_time[j] = arrival_time[j + 1];
                arrival_time[j + 1] = temp;

                temp = priority[j];
                priority[j] = priority[j + 1];
                priority[j + 1] = temp;

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

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

    waiting_time[0] = 0;
    int current_time = arrival_time[0];

    for (int i = 1; i < n; i++)
    {
        waiting_time[i] = burst_time[i - 1] + waiting_time[i - 1];
        current_time += burst_time[i - 1];
    }

    for (int i = 0; i < n; i++)
    {
        turnaround_time[i] = burst_time[i] + waiting_time[i];
    }

    printf("\nGantt Chart:\n");
    for (int i = 0; i < n; i++)
    {
        printf("| P%d ", processes[i]);
    }
    printf("|\n");
    current_time = arrival_time[0];
    for (int i = 0; i < n; i++)
    {
        printf("%d\t", current_time);
        current_time += burst_time[i];
    }
    printf("%d\n", current_time);

    printf("\nProcess\tArrival Time\tBurst Time\tPriority\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\t\t%d\n", processes[i],
arrival_time[i], burst_time[i], priority[i], waiting_time[i],
turnaround_time[i]);
    }

    float avg_waiting_time = 0, avg_turnaround_time = 0;
    for (int i = 0; i < n; i++)
```

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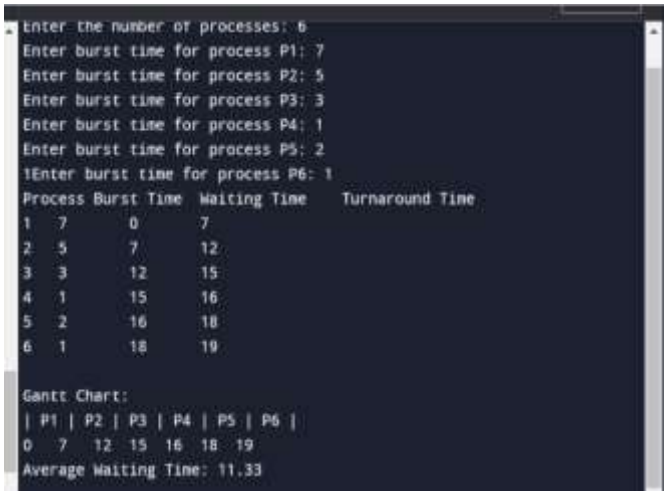
```
    {
        avg_waiting_time += waiting_time[i];
        avg_turnaround_time += turnaround_time[i];
    }
    avg_waiting_time /= n;
    avg_turnaround_time /= n;

    printf("\nAverage Waiting Time: %.2f\n", avg_waiting_time);
    printf("Average Turnaround Time: %.2f\n", avg_turnaround_time);
}

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

    int processes[n], burst_time[n], priority[n], arrival_time[n];
    for (int i = 0; i < n; i++)
    {
        printf("Enter arrival time for process P%d: ", i + 1);
        scanf("%d", &arrival_time[i]);
        printf("Enter burst time for process P%d: ", i + 1);
        scanf("%d", &burst_time[i]);
        printf("Enter priority for process P%d: ", i + 1);
        scanf("%d", &priority[i]);
        processes[i] = i + 1;
    }

    priorityScheduling(processes, n, burst_time, priority, arrival_time);

    return 0;
}
```

OUTPUT:

Q1



```
Enter the number of processes: 6
Enter burst time for process P1: 7
Enter burst time for process P2: 5
Enter burst time for process P3: 3
Enter burst time for process P4: 1
Enter burst time for process P5: 2
1Enter burst time for process P6: 1
Process Burst Time  Waiting Time    Turnaround Time
1   7       0       7
2   5       7       12
3   3       12      15
4   1       15      16
5   2       16      18
6   1       18      19

Gantt Chart:
| P1 | P2 | P3 | P4 | P5 | P6 |
0   7   12  15  16  18  19
Average Waiting Time: 11.33
```

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Q2

Q3