



**Faculty of Engineering and Technology  
Electrical and Computer Engineering Department**

**Computer Design Lab  
ENCS4110**

**Project 2**

Prepared by:

**Basmala abu hakema                    1220184  
Al-zahra Nassif                            1220168**

Instructor: **Yazan Abu Farha**

Section: **1**

Date: **4-1-2025**

## Test cases:

### 1) No deadlock:

First case: input file same as it was in the project  
time quanta = 20

```
processes x main.py
1 0 0 1 CPU {R[0], 50, F[0]}
2
3 1 5 1 CPU {20} IO{30} CPU {20, R[1], 30, F[1], 10}
4

main x
:
C:\Users\User\PycharmProjects\osproj\.venv\Scripts\python.exe C:\Users\User\PycharmProjects\osproj\main.py
processes: [[0, 0, 1, 50, 0, 0], [1, 5, 1, 20, 30, 60]]
number resources= 2, number process= 2
request [[0, 0, 0, 50, 1], [1, 1, 20, 30, 2]]

Gantt chart: [0, 1, 0, 0, 1, 1, 1]

Completed processes:
0:
    Finished at: 70
    Turnaround Time: 70
    Waiting Time: 20
1:
    Finished at: 130
    Turnaround Time: 125
    Waiting Time: 15

Average waiting time: 17.5
Average turnaround time: 97.5
-----
```

**second case:** two processes asking for the same recourse at the same time:

time quanta = 20

```
processes x main.py
1 0 0 1 CPU {R[0], 50, F[0]}
2
3 1 1 1 CPU {R[0], 50, F[0]}
4

n main x
:
C:\Users\User\PycharmProjects\osproj\.venv\Scripts\python.exe C:\Users\User\PycharmProjects\osproj\main.py
processes: [[0, 0, 1, 50, 0, 0], [1, 1, 1, 50, 0, 0]]
number resources= 1, number process= 2
request [[0, 0, 0, 50, 1], [0, 1, 0, 50, 1]]

Gantt chart: [0, 0, 0, 1, 1, 1]

Completed processes:
0:
    Finished at: 50
    Turnaround Time: 50
    Waiting Time: 0
1:
    Finished at: 100
    Turnaround Time: 99
    Waiting Time: 49

Average waiting time: 24.5
Average turnaround time: 74.5
-----
```

**third case:**

time quanta = 10

**Test case 1 (without deadlock):**

PID	Arrival Time	Priority	CPU / IO Bursts
0	0	0	CPU{10} IO{30} CPU{10}
1	0	0	CPU{20}

Gantt Chart



```
processes x main.py
1 0 0 0 CPU {10} IO{30} CPU {10}
2
3 1 0 0 CPU {20}
4

n main x

C:\Users\User\PycharmProjects\osproj\.venv\Scripts\python.exe C:\Users\User\PycharmProjects\osproj\main.py
processes: [[0, 0, 0, 10, 30, 10], [1, 0, 0, 20, 0, 0]]
number resources= 0, number process= 2
request []

Gantt chart: [0, 1, 1, 'idle', 0]

Completed processes:
1:
    Finished at: 30
    Turnaround Time: 30
    Waiting Time: 10
0:
    Finished at: 50
    Turnaround Time: 50
    Waiting Time: 0

Average waiting time: 5.0
Average turnaround time: 40.0
-----
Process finished with exit code 0
```

Here we have 10 idle each one unit time (idle is 1 sec)

## Forth case:

Time quanta: 20

```
processes x main.py
1 0 0 1 CPU {R[0], 60, R[1], 20, F[0], F[1]}
2
3
4 2 5 1 CPU {20} IO{20} CPU {20, R[1], 30, F[1], 10}
5

n main x
:
C:\Users\User\PycharmProjects\osproj\.venv\Scripts\python.exe C:\Users\User\PycharmProjects\osproj\main.py
processes: [[0, 0, 1, 80, 0, 0], [2, 5, 1, 20, 20, 60]]
number resources= 2, number process= 2
request: [[0, 0, 0, 80, 1], [1, 0, 60, 20, 1], [1, 2, 20, 30, 2]]

Gantt chart: [0, 2, 0, 2, 0, 2, 2, 0]

Completed processes:
2:
    Finished at: 140
    Turnaround Time: 135
    Waiting Time: 35
0:
    Finished at: 160
    Turnaround Time: 160
    Waiting Time: 80

Average waiting time: 57.5
Average turnaround time: 147.5
-----
```

## 2) Deadlock and recovery:

First case:

Time quanta 10

```
1   0   0   1   CPU {R[0], 15, R[1], 10, F[0], F[1]}
2
3   1   0   1   CPU {R[1], 15, R[0], 10, F[1], F[0]}
4
5   2   0   0   CPU {50}
6
7   |
```

processes: [[0, 0, 1, 25, 0, 0], [1, 0, 1, 25, 0, 0], [2, 0, 0, 50, 0, 0]]  
number resources= 2, number process= 3  
request: [[0, 0, 0, 25, 1], [1, 0, 15, 10, 1], [1, 1, 0, 25, 1], [0, 1, 15, 10, 1]]  
  
Deadlock detected! Process 1 is waiting for resource 0 held by blocked process 0  
Deadlock detected! Process 0 is waiting for resource 1 held by blocked process 1  
Deadlock processes [0, 1]  
At time 80  
Recovery:  
Terminating process 0 to break the deadlock.  
  
Gantt chart: [2, 2, 2, 2, 2, 0, 1, 0, 1, 1, 0, 0, 0]  
  
Completed processes:  
2:  
 Finished at: 50  
 Turnaround Time: 50  
 Waiting Time: 0  
1:  
 Finished at: 90  
 Turnaround Time: 90  
 Waiting Time: 65  
0:  
 Finished at: 115  
 Turnaround Time: 115  
 Waiting Time: 90  
  
Average waiting time: 51.666666666666664  
Average turnaround time: 85.0

## Second case:

Time quanta: 20

```
1 0 0 1 CPU {R[0], 20, R[1], 20, F[0], F[1]}
2
3 1 0 1 CPU {R[1], 20, R[0], 20, F[1], F[0]}
4
5 2 5 2 CPU {20} IO{5} CPU {20, R[1], 30, F[1], 10}

run main x

Deadlock detected! Process 1 is waiting for resource 0 held by blocked process 0
Deadlock detected! Process 0 is waiting for resource 1 held by blocked process 1
Deadlock processes [0, 1]
At time 40
Recovery:
Terminating process 0 to break the deadlock.

Gantt chart: [0, 1, 0, 1, 1, 0, 0, 2, 'idle', 'idle', 'idle', 'idle', 2, 2, 2]

Completed processes:
1:
    Finished at: 60
    Turnaround Time: 60
    Waiting Time: 20
0:
    Finished at: 100
    Turnaround Time: 100
    Waiting Time: 60

Gantt chart: [0, 1, 0, 1, 1, 0, 0, 2, 'idle', 'idle', 'idle', 'idle', 2, 2, 2]

Completed processes:
1:
    Finished at: 60
    Turnaround Time: 60
    Waiting Time: 20
0:
    Finished at: 100
    Turnaround Time: 100
    Waiting Time: 60
2:
    Finished at: 185
    Turnaround Time: 180
    Waiting Time: 95

Average waiting time: 58.33333333333336
Average turnaround time: 113.33333333333333
-----
```

**For the discussion:**

0	0	1	CPU {R[0], 50, F[0]}		
1	5	1	CPU {20}	IO{30}	CPU {34, R[1], 30, F[1], 10}
2	6	3	CPU {20, R[2], 30, F[2], 10}		
3	4	2	CPU {15}	IO{32}	CPU {25}
5	5	1	CPU {70}	IO{30}	CPU {R[3], 45, F[3]}
6	10	4	CPU {R[0], 20, R[1], 20, F[0], F[1]}		