Rawan Alzowaid
CSCI-3753
Problem set 3

Q1:

The System is in a safe state !

1. We start by given resources to P2 :

R0	R1	R2	R3
2	2	2	1

2. Then give resources to P3 :

R0	R1	R2	R3
3	2	3	1

3. Give resources to P4 :

R0	R1	R2	R3
3	3	3	2

4. Then give resources to P1 :

R0	R1	R2	R3
4	4	3	2

5. Give resources to P0 :

R0	R1	R2	R3
6	4	4	2

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Q2:

If we were to assume and make R0 to be chopsticks and R1 to be the serving spoon:

- Our max claims :

	R0	R1
P1	2	1
P2	2	1
P3	2	1
P4	2	1
P5	2	1

- Current Allocation :

	R0	R1
P1	1	1
P2	1	0
P3	1	0
P4	1	0
P5	1	0

- Request :

	R0	R1
P1	1	0
P2	1	0
P3	1	0
P4	1	1
P5	1	0

Thus, the philosophers need one more chopsticks to eat but there are no more available chopsticks (R0) since we allocated all of them which will create a deadlock. Whereas the serving spoon can be allocated to the 4^{th} philosopher easily since it's available.

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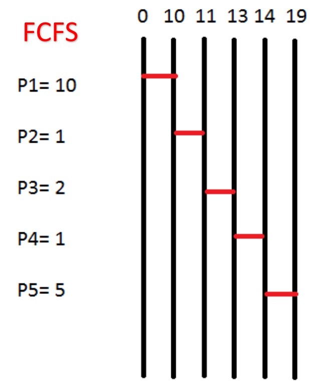
Q3:

1. Using First Come First Serve (FCFS):

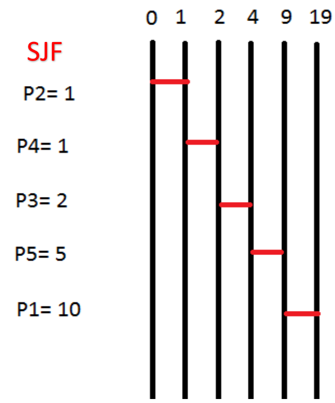
```
FCFS:
|    P1    | P2 | P3 | P4 | P5 |
0         10   11   13   14   19
```



- Wait time: (10+11+13+14)/5= 9.6 s
- Turnaround time: (10+11+13+14+19)/5= 13.4 s

2. Using Shortest Job First (SJF):

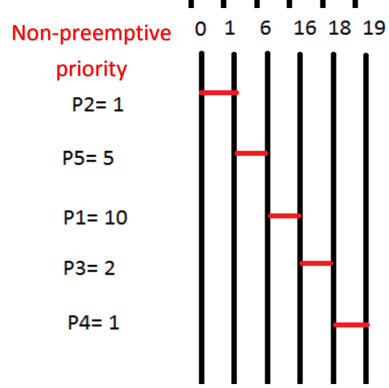
```
SJF:
| P2 | P4 | P3 | P5 | P1 |
0    1    2    4    9    19
```



- Wait time : (1+2+4+9)/5 = 3.2 s.
- Turnaround time: (1+2+4+9+19)/5= 7s

3. Using non-preemptive priority:

```
Non-preemptive Priority:
| P2 | P5 | P1 | P3 | P4 |
0    1    6    16   18   19
```

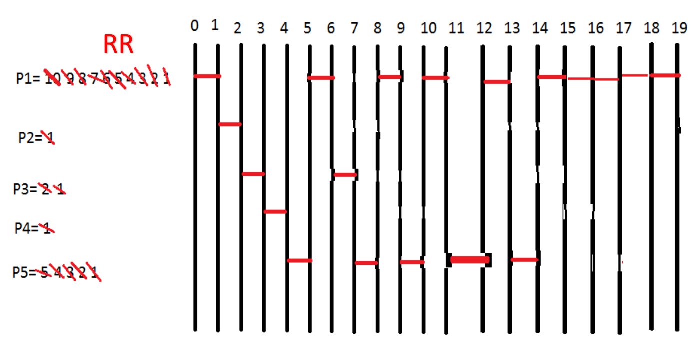


- Wait time : (1+6+16+18)/5= 8.2 s
- Turnaround time: (1+6+16+18+19)/5= 12 s

4. Using Round Robin (RR):

```
Round Robin:
|P1|P2|P3|P4|P5|P1|P3|P5|P1| P5 | P1 | P5 | P1 | P5 | P1 | P1 | P1 | P1 | P1 |
0  1  2  3  4  5  6  7  8  9   10   11   12   13   14   15   16   17   18   19
```

- Wait time: 5.4 s
- Turnaround time: 9.2 s



** SFJ has the lowest average wait times and turnaround

Times.

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Q4:

a)

T1	T2	P2	T1
Time --- >			

Given time T to the task	T1	T2	T3
T1	-2T/3	T/3	T/3
T2	-1T/3	-1T/3	2T/3
P2	0	0	0

b) When we are at the level where we schedule the tasks, the system is fair because each task is shared equally. However, when we get the process level, the system is not fair because there are shared resources between the processes.