# Homework #1
# CSC 415-01

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# CSC415 OPERATING SYSTEM PRINCIPLES

# Homework 1

1. What is the difference between symmetric multiprocessing and asymmetric multiprocessing? (10 Points)

   A: In symmetric multiprocessing, all processors works equally, whoever wants to use I/O can use it, while in asymmetric multiprocessing, there is only one dominant and the others are working for him, after those "employees" finish their work, they tell the dominant processor to use I/O.

2. Why do user programs have to make system calls rather than just executing the code for the system calls themselves? (10 Points)

   A: To use kernel mode is to protect the system from damaging by user. User mode can only make simple changes.

3. What are the four sections in the address space of a process? What is the Process Control Block? (10 Points)

   A: Text section, data section, stack, and heap. PCB is a data structure in the operating system kernel containing the information needed to manage a particular process.

4. Assuming there are no errors, how many NEW processes will the following code create? Why? (10 Points)

```
if (!fork())      //1
        fork();  //2
else {
        fork(); // 3
        fork(); // 4
```

A: There will be 6 processes including the parent, where the parent has 3 child from 1st, 3rd and 4th fork(), and in the children which are created in 1st and 3rd, they also create one child. So the total is 6.

5. Describe the actions taken by a kernel to context-switch between processes? (10 Points)

A: In the kernel, the system store and save the status of the current works, and recall the scheduled works that recover the saved works before

6. What are the two models for Inter-Process Communication? What are their differences? (10 Points)

A: Message passing and shared memory.

Message passing: There is no memory sharing in message passing, they use send() and receive() to send and receive datas.

Shared memory: Data are read and written in the same memory place.

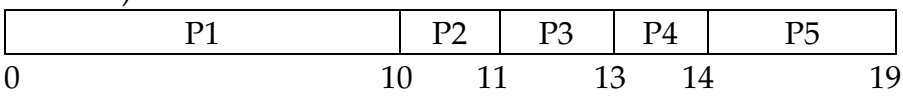
7. Consider the following set of processes, with the length of the CPU-burst time given in milliseconds: (40 Points)

| Process | Burst Time | Priority |
|---|---|---|
| *P*1 | 10 | 3 |
| *P*2 | 1 | 1 |
| *P*3 | 2 | 3 |
| *P*4 | 1 | 4 |
| *P*5 | 5 | 2 |

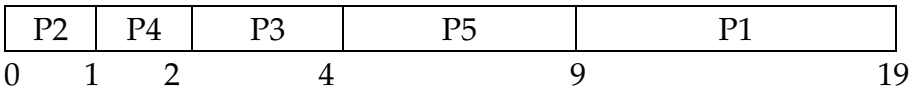
The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all at time 0.

a. Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, a nonpreemptive priority (a smaller priority number implies a higher priority), and RR (quantum = 1) scheduling.
b. What is the turnaround time of each process for each of the scheduling algorithms in Part a?
c. What is the waiting time of each process for each of the scheduling algorithms Part a?
d. What is the average waiting time for each of the scheduling algorithms in Part a?

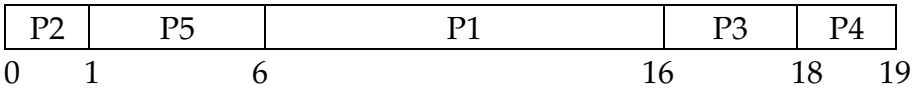
a.) First come first serve



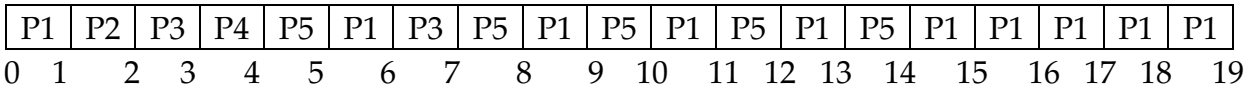

Shortest jobs first




Nonpreemptive prority




RR




b.) FCFS
P1: 10, P2: 11, P3: 13, P4: 14, P5: 19
SJF
P1:19, P2:1, P3: 4, P4:2, P5:9
Nonpreemptive priority
P1:16, P2:1, P3:18, P4: 19, P5: 6
RR
P1: 19, P2: 2, P3:7, P4:4, P5:14

c.)

FCFS:
P1 = 0, P2 = 10, P3 = 11, P4 = 13, P5=14

SJF:
P2 = 0, P4 = 1, P3 = 2, P5 = 4, P1 = 9

Nonpreemptive priority
P2 = 0, P5 = 1, P1 = 6, P3 = 16, P4 = 18

RR
P1 = 9, P2 = 1, P3 = 5, P4 = 3, P5 = 9

d.)
FCFS: 0+10+11+13+14 = 48, 48/5 = 9.6
SJF: 9+0+2+1+4 = 16, 16/5 = 3.2
Nonpreemptive priority 6+0+16+18+1 = 41, 41/5 = 8.2
RR: 9+1+5+3+9 = 27, 27/5 = 5.4