# Operating Systems Examination
## 2017-2018/2 - Test A

**Full name:** _____

**Username:** _____

**Group:** _____ **Grade:**

1. Write a UNIX Shell command that displays the lines in file a.txt that contains words starting with capital letters.

2. Write a UNIX Shell command that inverts in file a.txt all pairs of neighboring digits (ex a3972b -> a9327b)

3. File a.txt contains on each line two numbers separated by space. Write a UNIX Shell command that displays for each line the sum of its numbers.

4. Display only the lines of file a.txt that appear only once (not duplicated).

5. Write a UNIX Shell script that displays the name of each .txt file in the current directory that contains the word "cat".

6. In the program fragment below, mark which process executes each line: the **P**arent, the **C**hild, or both.

| P | C | |
|---|---|---|
| | | `k = fork();` |
| | | `if(k == 0) {` |
| | | `    printf("A\n");` |
| | | `}` |
| | | `else {` |
| | | `    printf("B\n");` |
| | | `}` |
| | | `printf("C\n");` |

7. How many processes will be created by the code fragment below, excluding the initial parent process?

```
fork(); wait0); fork(); wait(0); fork();
```

8. What are the possible console outputs of the following code fragment (ignoring any output that execl might generate), and when will they happen?

```
printf("A\n"); execl(....); printf("B\n");
```

9. What does the system call "read" do when the pipe is empty?

10. What does the system call "open" do before returning from opening a FIFO?

11. Give a reason for choosing threads over processes.

12. Considering that functions "fa" and "fb" are run in concurrent threads, what will the value of "n" be after the threads are finished? Why?

```
pthread_mutex_t a, b;
int n = 0;
void* fa(void* p) {
    pthread_mutex_lock(&a);
    n++;
    pthread_mutex_unlock(&a);
}
void* fb(void* p) {
    pthread_mutex_lock(&b);
    n++;
    pthread_mutex_unlock(&b);
}
```

13. Schedule the following jobs (given as Name/Duration/Deadline) so that they all meet their deadlines: A/5/9, B/7/13, C/1/10

14. Give one advantage and one disadvantage of the segmented allocation method over the paged allocation method.

15. When would you load into memory the pages of a program that is being started?

16. When does a process change state from RUN to READY?

17. Given a UNIX file system configured with a block size of B bytes that can contain A addresses, and i-nodes having S direct link, one simple indirection link, one double indirection link, and one triple indirection link, give the formula for the maximum file size possible.

18. What happens with the data when you delete a file that has a hard link pointing to it?

19. Give a method for preventing deadlocks.

20. What is a binary semaphore, and what is the effect of its P method, when called by multiple concurrent processes/threads?