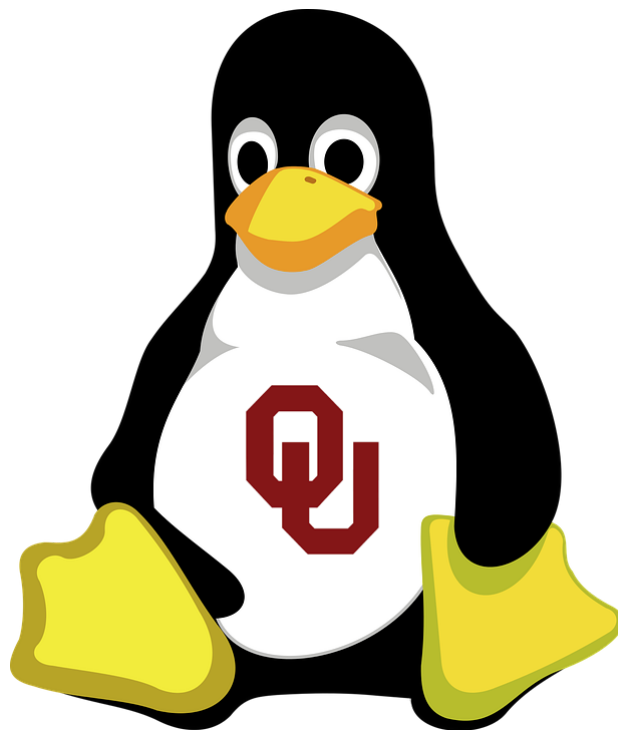


# CS 3113 Spring 2019 Midterm Exam (D)

Name: \_\_\_\_\_ 4 X 4: \_\_\_\_\_



On completion, please sign the Academic Integrity Statement. Exams without this signed will receive a zero. Be prepared to show your ID to the proctor. All questions have equal value. There are 30 questions over 15 pages. Each question is equal-valued. Mark your answers clearly in the provided bubble sheet. If you cannot erase an answer, clearly mark an X through the bubble.

“On my honor, I affirm that I have neither given nor received inappropriate aid in the completion of this exercise.”

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

1. Below is a list of definitions. Choose *each* definition that describes a **process**.

- A. A program in execution
- B. Version-controlled code on disk
- C. An instance of a program running on a computer
- D. The entity that can be assigned to and executed on a processor

2. Given the code below. How many times will the string "Hello!" print?

```
#include <stdio.h>
#include <unistd.h>
int main() {
    int i;
    for (i=1; i<5; ++i)
        if ( i%2 == 0 )
            fork();
    printf("Hello!\n");
    return 0;
}
```

- A. 12
- B. 4
- C. 6
- D. 18

3. Given the list of terms, select the terms that *do not* constitute information found within the PCB. For each term that does not belong in the PCB describe why designers may not have added it to the PCB.

- A. Process Identifier
- B. Process Priority
- C. Program counter
- D. Memory pointers
- E. File Permissions

4. True or False: In the UNIX IO Model, specialized system calls are needed to access each type of IO device.

- A. True
- B. False

5. True or False: When two processes simultaneously and independently open the same file name, they maintain independent file offsets.

- A. True
- B. False

6. True or False: All data accessible by a process is exclusively owned by that process.
- A. True
  - B. False
7. As you travel up the memory hierarchy (to the smallest-sized memory) which of the following is true?
- A. Decreasing cost per bit and increasing access time
  - B. Increasing cost per bit and increasing access time
  - C. Increasing cost per bit and decreasing access time
  - D. Decreasing cost per bit and decreasing access time
  - E. Answer not shown
8. True or False: A process must be in kernel mode in order to output data onto a USB stick.
- A. True
  - B. False

9. A system call provides detailed error information back to the user program by doing what? (pick the best answer)

- A. Returning an error code
- B. Printing an error message to STDOUT
- C. Sending an error message to the system log
- D. Setting the global variable errno
- E. Answer not shown

10. In the following program, the parent process is to send an *int* to the child, which then prints out the value. On which line is there a bug?

```
1  int main(int argc, char** argv)
2  {
3      int filedes[2];
4
5      if(pipe(filedes) == -1) {
6          fprintf(stderr, "Error\n");
7          exit(-1);
8      }
9
10     int pid;
11     if((pid = fork()) == -1) {
12         fprintf(stderr, "Error\n");
13         exit(-1);
14     }else if(pid > 0){
15         close(filedes[1]);
16         int val = 42;
17         write(filedes[0], &val, sizeof(int));
18         sleep(1);
19     }else{
20         close(filedes[1]);
21         close(0);
22         dup2(filedes[0], 0);
23
24         int myval;
25         if(read(0, &myval, sizeof(int)) != sizeof(int)){
26             fprintf(stderr, "Error\n");
27             exit(-1);
28         }
29         printf("Got: %d\n", myval);
30     }
31 }
```

- A) 15 B) 20 C) 22 D) 25 E) There is no bug

11. True or False: In the 5-state process model, a process in the blocked state can move directly to the running state.

A. True

B. False

12. Which of the following describes a *critical section*?

A. A block of memory that is reserved for the operating system

B. A block of memory that is reserved for a process

C. A block of memory that is shared between two processes

D. A sequence of operations that should not be interrupted

E. Answer not shown

13. The following function creates a book structure, assigns it an id and a name, then prints out the stored book information.

On which line is the bug?

```
1 #include <stdio.h>
2 #include <stdlib.h>
3 #include <string.h>
4
5 struct book {
6     int id; // 4 bytes
7     char name[15]; // 15 bytes
8 };
9
10 int main () {
11
12     struct book library[3];
13     library[0].id = 1235;
14     strcpy(library[0].name, "East of Eden");
15     printf("book[0]: %d, %s\n",
16         library[0].id,
17         library[0].name);
18     return 0;
19 }
```

- A. 7
- B. 12
- C. 13
- D. 14
- E. There is no bug

**14. What does `size_t` represent in C?**

- A. Used to represent the size of the keyboard.
- B. Used to represent the size of the mouse.
- C. Used to express the size of an object as a number of bits.
- D. Used to express the size of an object as a number of bytes.

**15. Which of the following statements about the syscall "trap" instruction is true?**

- A. It switches the processor state from kernel to user mode.
- B. It is the final stage in the system call process.
- C. When invoked, it prevents the shared usage of certain resources.
- D. It is the common entry point for all system calls.

**16. What is a File Descriptors:**

- A. Contains define rules for how to create derived files that include invocation of the compiler.
- B. A non-negative integer that may refer to regular files, pipes, FIFOs, sockets, terminals or devices.
- C. Also called a file pointer to identify an opened file.



17. What does the `malloc()` function do?

- A. Allocate a block of memory on the heap
- B. assign a memory location with a value.
- C. Increment a pointers address by a specified value
- D. None of the above

18. Which of the following represents the correct for alignment big endian? *The multibyte string is 012345 starting at address 0x100.*

- |   |   |   |
|---|---|---|
| <p>A. [45] 0x100<br/>[67] 0x101<br/>[01] 0x102<br/>[23] 0x013</p> | <p>B. [67] 0x100<br/>[45] 0x101<br/>[23] 0x102<br/>[01] 0x013</p> | <p>C. [01] 0x100<br/>[23] 0x101<br/>[45] 0x102<br/>[67] 0x013</p> |
|---|---|---|

D. None of the above

19. The Unix command, **`chmod 751 filename.txt`**, sets the permissions of `filename.txt` to which of the following?

- A. *User*: read, write, and execute; *Group*: read, write; *Other*: read
- B. *User*: read, write, and execute; *Group*: write; *Other*: read
- C. *User*: read, write, and execute; *Group*: read, execute; *Other*: read
- D. *User*: read, write, and execute; *Group*: read, execute; *Other*: execute

20. Given a the snippet of code below:

```
char* str = NULL;  
str = (char*) malloc(10);  
strcpy(str, "Hello");
```

What is the correct way to print the char 'e'?

- A. `printf("%s", str[1]);`
- B. `printf("%c", str + 1);`
- C. `printf("%c", *(str+1));`
- D. `printf("%s", str+2)`
- E. None of the above

21. The following program uses `qsort` to sort an array (in place) into decreasing order. In what is output by this program?

```
#include <stdio.h>
#include <stdlib.h>

int intcmp(const void *x, const void *y) {
    return -(*(int*) x - *(int*) y);
}

int main() {
    int array[6] = {5, 1, 6, 8, 3, 9};
    int *p = &array[0];
    qsort(array, 6, sizeof(int), intcmp);
    p = p+3;
    p = p-2;
    printf("%d", *p);
    return 0;
}
```

- A. 3
- B. 1
- C. 8
- D. core dump

22. What is the result of a successful `chmod 567` in standard `chmod` notation?

- A. `rwX rw- r-x`
- B. `r-x rw- rwx`
- C. `-wX rw- r--`
- D. `--X -w- rw-`

23. When a shell program is run what, by default, is the file descriptor of standard input `STDIN_FILENO`?

- A. 0
- B. 1
- C. 2
- D. 3

## 24. What is wrong with the makefile below?

```
all: stack node

stack: stack.c
gcc -o structure structure.c

node: node.c
gcc -o node node.c

clean:
  rm stack
  rm node
```

- A. Unnecessary clean commands
- B. Too many arguments for *all:* command
- C. Missing tab-space before gcc commands
- D. None of the above

## 25. Which one of the following is least likely to be a syscall or syscall wrapper in an OS?

- A. fork()
- B. wait()
- C. open()
- D. read()
- E. printf()

26. A situation in which a runnable process is overlooked indefinitely by the scheduler, although it is able to proceed, is which of the following?

- A. mutual exclusion
- B. deadlock
- C. starvation
- D. livelock

27. Below are two example processes that are using a shared variable turn to manage progress. Which of the following statements are true?

```
/*PROCESS 0 */  
while (turn != 0)  
    /* do nothing */;  
  
/*critical section */;  
turn = 1;
```

```
/*PROCESS 1 */  
while (turn != 1)  
    /* do nothing */;  
  
/*critical section */;  
turn = 0;
```

- A. If process 0 fails in the critical section; process 1 cannot continue
- B. The turn variable is equivalent to a binary semaphore
- C. The process 0 speed of execution can skew the total progress
- D. None of the above are true

28. Is the following statement true or false:

The `pthread_join()` is equivalent to the `wait()` command but instead of waiting on any process to complete, it will wait on any thread to complete.

- A. True
- B. False

29. Is the following statement True or False:

When new Posix threads are spawned from the same process they each share the execution stack for efficiency.

- A. True
- B. False

30. Is the following statement True or False:

The function `pthread_equal()` is needed to compare thread identifiers because the `pthread_t` data type cannot be compared with the `'=='` operator.

- A. True
- B. False