CS241 Multiple Choice Exam 1 Practice Exam

1. (1 point) The following expression uses `sizeof` and `strlen` function. What is the value of result?

```
int result = 1 + sizeof("abc") + ( sizeof("abc") * strlen("abc") );
```

(A) 21

(B) 13

(C) None of the other responses are correct

(D) 17

(E) 16

2. (1 point) Which one of the following best describes for the following C code?

```
1 char array[] = "ABCD";
2 char x = array[5];
3 char y = array[0];
4 x = y;
```

(A) The program will crash at line 4

(B) The program will not compile

(C) Buffer overflow at line 2. `x` may contain data from another variable

(D) None of the other responses are correct

(E) Buffer overflow at line 3. `y` may contain data from another variable

3. (1 point) Which one of the following does not depend on the computer architecture?

(A) sizeof(int)

(B) sizeof(char*)

(C) sizeof(char)

(D) sizeof(void*)

(E) sizeof(int*)

4. (1 point) Which of the following best describes the C code below? Assume this is part of a C main method and malloc returns a non-NULL value.

```
1  int* ptr = (int*) malloc(sizeof(int));
2  *ptr = 42;
3  free(ptr);
4  ptr = (int*) 42;
5  free(ptr);
```

(A) Will always crash at line 3

(B) May crash at line 2 if an integer requires more than 4 bytes of storage

(C) C uses 'new' and 'delete' not 'malloc' and 'free'

(D) Allocates 4 bytes of memory on the stack

(E) Will always crash at line 5

5. (1 point) Which response best describes the behavior of the following code?

```
int mystery(char*start) {
  if( start == NULL) return NULL;
  char* p= start;
  while(*p !='q') p++;
  return p - start;
}
```

(A) `mystery("ABC")` is undefined (and may crash)
(B) `mystery(NULL)` is undefined (and may crash)
(C) `mystery("q")` returns 1
(D) `mystery(NULL)` returns 1
(E) `mystery("q")` returns 2

6. (1 point) If `sizeof(int)` is 2 what will be the expected output of the following C code?

```
char* ptr = "ABCDEF";
int * x = (int*) ptr;
printf("%s", x + 1 );
```

(A) `EF`
(B) `ABCDEF1`
(C) `Segmentation Fault`
(D) `BCDEF`
(E) `CDEF`

7. (1 point) Carefully read the following C code and determine how often it will print `lucky`.

```
int a = rand(); /* returns a random int */
if( a = 0) printf("You're lucky!");
```

(A) You are never lucky
(B) You have a small chance of being lucky
(C) You are always lucky

8. (1 point) The following C code is executed as part of a main method. Which line, if any, will likely cause the program to crash?

```
1  char * ptr = (char*) rand(); /* rand() returns an random integer value */
2  int * b = (int*) ptr;
3  b = b + 1;
4  ptr = (char*) rand();
5  *ptr = (char) rand();
```

(A) 5
(B) None of the other responses are correct
(C) 3
(D) 4
(E) 2

9. (1 point) My C program prints `Hello 42 0x38a`. Which response is the best choice for the next line?

```
1 char* ptr = "Hello";
2 int x = 84 >>1;
3 ?
```

 (A) `printf("%s %d %p",ptr,x,ptr);`
 (B) `printf("$1s $2d $1p",ptr,x);`
 (C) `cout <<ptr<<" "<<x<<" 0x38a";`
 (D) `printf("${ptr} ${x} 0x38a");`
 (E) `write(ptr,5);write(x,2); write(*ptr,5);`

10. (1 point) Which one of the following best describes `malloc`?

 (A) `malloc` will always successfully allocate heap memory
 (B) `malloc` will throw an exception if there is insufficient free ram
 (C) None of the other responses are correct
 (D) `malloc` will return −1 if it cannot reserve sufficient stack memory
 (E) `malloc` will return `NULL` if it cannot reserve sufficient heap memory

11. (1 point) Which one of the following is NOT correct?

 (A) man pages describe system calls (section 2) and library calls (section 3) and include return values and required header files.
 (B) Variables with the static modifier are allocated using stack memory
 (C) `man atoi` is example of using the 'man' utility to read the manual page on `atoi` C library call
 (D) `man fork` is example of using the 'man' utility to read the manual page on `fork` system call
 (E) Temporary, non-static variables declared inside a function are called 'automatic variables' and are allocated on the stack

12. (1 point) Which one of the following is NOT correct?

 (A) `cat abc` will print the contents of the file `abc` to the terminal
 (B) A C string is just an array of `char`s which is terminated with a null character
 (C) `./bitcoin > coins` runs a program named `bitcoin` but redirects standard output to a file named `coins`
 (D) A single variable of C type `char` is not sufficient to store an international unicode (16 bit) character
 (E) Writing a null character into the middle of a C string will have no effect when the string is printed

13. (1 point) The `printf` function declaration can be included in your C program by writing...

 (A) `#include <iostream>`
 (B) `#include <stdio.h>`
 (C) `#define "sys/printf.h"`
 (D) `#define iostream.h(printf)`
 (E) None of the other responses are correct

14. (1 point) Which response best describes the following code? Assume `ptr` holds the address 0x8400.

```
1 void* ptr =   /* code not shown */
2 char* ptr2 = (char*)ptr;
3 void* x = & ptr2 + 1;
4 int result = *(ptr2 +1);
```

(A) One byte of memory at address 0x8401 is read at line 4
(B) None of the other responses are correct
(C) One byte of memory at address 0x8401 is read at line 3
(D) Line 4 has a syntax error
(E) One byte of memory at address 0x8400 is read at line 2

15. (1 point) Which response best describes the following student code that attempts to implement string copy?

```
1 void mystery(char*dest, char*src) {
2  if( src == NULL || dest==NULL) return;
3  while(*src) {
4    dest = src;
5    src ++; dest++;
6  }
7  *dest = (char)0;
8 }
```

(A) The function will be correct by changing a small error at line 7
(B) The function will be correct by changing a small error at line 4
(C) The function will be correct by changing a small error at line 5
(D) The function will be correct by changing a small error at line 3
(E) The function will be correct by changing two small errors at line 4 and 5

16. (1 point) Which of the following best describes the design goal(s) of an operating system?

(A) An operating system provides security and guards against malfunctioning user programs
(B) All of the other responses are correct
(C) An operating system must efficiently manage scarce resources (CPU cores, RAM,...)
(D) An operating system provides a level of abstraction above low-level hardware interfaces
(E) An operating system provides a set of services to user programs that can be accessed by system calls

17. (1 point) Which one of the following best describes the `free` call in the following code example?

```
1  int* v = NULL;
2  free(v);
```

(A) Is invalid and commonly described as a 'free-on-null' error
(B) Is invalid and commonly described as a 'NULL-free' error
(C) Frees up all previously allocated memory
(D) The above `free` call has no effect and is error free

18. (1 point) Which one of the following is correct?

(A) `write` and `printf` are identical and have the same function prototype
(B) `printf` always calls `write` when it is called with more than one argument
(C) `printf` is a system call, `write` is a C library call
(D) `printf` uses a buffer so may not call `write` every time it is called
(E) `write` always calls `printf` when it is called

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19. (1 point) Which one of the following is true for typical layout of a process's memory?

(A) Program constants are stored in the stack
(B) Writing to read-only memory is ignored by the operating system
(C) All of the process's memory address maps to physical RAM address
(D) Program code is not stored in the process's memory
(E) Program constants are read-only

20. (1 point) In the Linux operating system, which is based on the POSIX standard, which one of the following is true?

(A) Processes can write directly into another processes memory to easily crash the other process
(B) Shell utilities (e.g. `cat ls make`) are written in assembler
(C) The overhead of a system call is the same as a C library call
(D) Each process is isolated and runs in its own virtual memory space
(E) A program can only be run by a single user at a time

21. (1 point) Which one of the following best describes how to find the length of a C string?

(A) Requires O(N) reverse linear search
(B) Requires O(1) lookup to read the length byte
(C) Requires O(N) search to find the terminating null character \0
(D) Is compiler dependent and not part of the C specification
(E) None of the other responses are correct

22. (1 point) Which of the following best describes the C code below? Assume this is part of a C main method and malloc returns a non-NULL value.

```
1  void* v = malloc(4);
2  free(v);
3  free(v);
```

(A) To be error free line 1 requires a cast to an int or character pointer
(B) Allocates 4 bytes of memory on the stack
(C) Is a memory allocation error described as "free after malloc"
(D) Is a memory allocation error described as "double free"
(E) Is valid and error-free

23. (1 point) Which one of the following correctly allocates enough bytes on the heap to copy an existing string pointed to by a character pointer, `char* src`?

(A) `malloc( sizeof(src) + 1);`
(B) `char array[ strlen(src) ];`
(C) `new string( sizeof(src) + 1);`
(D) None of the other responses are correct
(E) `malloc( strlen(src) + 1);`