CS241 SP15 Exam 1: Solution Key

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A VERSION OF THESE QUESTIONS MAY APPEAR IN A FUTURE QUIZ

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1. (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) Is a memory allocation error described as "free after malloc"

(C) Is valid and error-free

(D) Is a memory allocation error described as "double free"

(E) Allocates 4 bytes of memory on the stack

Correct answer: D.
Your answer: E.
0 out of **1** point received

2. (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) None of the other responses are correct

(B) `malloc( strlen(src) + 1);`

(C) `char array[ strlen(src) ];`

(D) `new string( sizeof(src) + 1);`

(E) `malloc( sizeof(src) + 1);`

Correct answer: B.
Your answer: A.
0 out of **1** point received

3. (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) None of the other responses are correct

(B) The program will crash at line 4

(C) The program will not compile

(D) `y` may contain data from another variable

(E) `x` may contain data from another variable

Correct answer: E.
Your answer: E.
0 out of **1** point received

4. (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("$1s $2d $1p",ptr,x);`

(B) `printf("%s %d %p",ptr,x,ptr);`

(C) `cout <<ptr<<" "<<x<<" 0x38a";`

(D) `printf("${ptr} ${x} 0x38a");`

(E) `write(ptr,5);write(x,2); write(*ptr,5);`

Correct answer: B.
Your answer: C.
0 out of **1** point received

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("q")` returns 1

(C) `mystery(NULL)` returns 1

(D) `mystery("q")` returns 2

(E) `mystery(NULL)` is undefined (and may crash)

Correct answer: A.
Your answer: A.
0 out of **1** point received

6. (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) `man fork` is example of using the 'man' utility to read the manual page on `fork` system call

(C) `man atoi` is example of using the 'man' utility to read the manual page on `atoi` C library call

(D) Variables with the static modifier are allocated using stack memory

(E) Temporary, non-static variables declared inside a function are called 'automatic variables' and are allocated on the stack

Correct answer: D.
Your answer: D.
0 out of **1** point received

7. (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(int*)

(E) sizeof(void*)

Correct answer: C.
Your answer: D.
0 out of **1** point received

8. (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) `ABCDEF1`

(B) `CDEF`

(C) `EF`

(D) `Segmentation Fault`

(E) `BCDEF`

Correct answer: B.
Your answer: B.
0 out of **1** point received

9. (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) 4

(B) 2

(C) 3

(D) None of the other responses are correct

(E) 5

Correct answer: E.
Your answer: D.
0 out of **1** point received

10. (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) Program code is not stored in the process's memory

(C) Writing to read-only memory is ignored by the operating system

(D) Program constants are read-only

(E) All of the process's memory address maps to physical RAM address

Correct answer: D.
Your answer: E.
0 out of **1** point received

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

(A) Writing a null character into the middle of a C string will have no effect when the string is printed

(B) A single variable of C type `char` is not sufficient to store an international unicode (16 bit) character

(C) `./bitcoin > coins` runs a program named `bitcoin` but redirects standard output to a file named `coins`

(D) `cat abc` will print the contents of the file `abc` to the terminal

(E) A C string is just an array of `char`s which is terminated with a null character

Correct answer: A.
Your answer: B.
0 out of **1** point received

12. (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) Line 4 has a syntax error

(B) None of the other responses are correct

(C) One byte of memory at address 0x8400 is read at line 2

(D) One byte of memory at address 0x8401 is read at line 4

(E) One byte of memory at address 0x8401 is read at line 3

Correct answer: D.
Your answer: A.
0 out of **1** point received

13. (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) None of the other responses are correct

(B) 13

(C) 17

(D) 16

(E) 21

Correct answer: C.
Your answer: D.
0 out of **1** point received

14. (1 point.) The `printf` function declaration can be included in your C program by writing...

(A) `#define iostream.h(printf)`

(B) `#define "sys/printf.h"`

(C) None of the other responses are correct

(D) `#include <iostream>`

(E) `#include <stdio.h>`

Correct answer: E.
Your answer: C.
0 out of **1** point received

15. (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 are always lucky

(C) You have a small chance of being lucky

Correct answer: A.
Your answer: C.
0 out of **1** point received

16. (1 point.) In the Linux operating system, which is based on the POSIX standard, which one of the following is true?

(A) The overhead of a system call is the same as a C library call

(B) Each process is isolated and runs in its own virtual memory space

(C) Processes can write directly into another processes memory to easily crash the other process

(D) A program can only be run by a single user at a time

(E) Shell utilities (e.g. `cat ls make`) are written in assembler

Correct answer: B.
Your answer: B.
0 out of **1** point received

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

(B) Will always crash at line 5

(C) Allocates 4 bytes of memory on the stack

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

(E) Will always crash at line 3

Correct answer: B.
Your answer: A.
0 out of **1** point received

18. (1 point.) Which one of the following best describes `malloc`?

(A) `malloc` will throw an exception if there is insufficient free ram

(B) `malloc` will always successfully allocate heap memory

(C) `malloc` will return -1 if it cannot reserve sufficient stack memory

(D) `malloc` will return `NULL` if it cannot reserve sufficient heap memory

(E) None of the other responses are correct

Correct answer: D.
Your answer: A.
0 out of **1** point received

19. (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 'NULL-free' error

(B) Is invalid and commonly described as a 'free-on-null' error

(C) The above `free` call has no effect and is error free

(D) Frees up all previously allocated memory

Correct answer: C.
Your answer: D.
0 out of **1** point received

20. (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  *src = (char)0;
8 }
```

(A) The function will be correct by changing a small error at line 4

(B) The function will be correct by changing a small error at line 7

(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

Correct answer: B.
Your answer: A.
0 out of **1** point received

21. (1 point.) Which one of the following is correct?

(A) `write` always calls `printf` when it is called

(B) `printf` uses a buffer so may not call `write` every time it is called

(C) `write` and `printf` are identical and have the same function prototype

(D) `printf` always calls `write` when it is called with more than one argument

(E) `printf` is a system call, `write` is a C library call

Correct answer: B.
Your answer: B.
0 out of **1** point received

22. (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) An operating system must efficiently manage scarce resources (CPU cores, RAM,...)

(C) An operating system provides a set of services to user programs that can be accessed by system calls

(D) An operating system provides a level of abstraction above low-level hardware interfaces

(E) All of the other responses are correct

Correct answer: E.
Your answer: B.
0 out of **1** point received

23. (1 point.) Which one of the following best describes how to find the length of a C string?

(A) Requires O(N) search to find the terminating null character \0

(B) None of the other responses are correct

(C) Is compiler dependent and not part of the C specification

(D) Requires O(N) reverse linear search

(E) Requires O(1) lookup to read the length byte

Correct answer: A.
Your answer: D.
0 out of **1** point received

Summary of answers:

Question	Correct Answer	Your Answer	Points
1	D	E	0
2	B	A	0
3	E	E	0
4	B	C	0
5	A	A	0
6	D	D	0
7	C	D	0
8	B	B	0
9	E	D	0
10	D	E	0
11	A	B	0
12	D	A	0
13	C	D	0
14	E	C	0
15	A	C	0
16	B	B	0
17	B	A	0
18	D	A	0
19	C	D	0
20	B	A	0
21	B	B	0
22	E	B	0
23	A	D	0
Total			0