

## CS241 SP15 Exam 1: Solution Key

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**Name:** Geng, Y.

**UIN:** 656934543

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**Exam code:** CACAEB

**NetID:** yangeng2

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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

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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

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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) Buffer overflow at line 3. `y` may contain data from another variable
- (E) Buffer overflow at line 2. `x` may contain data from another variable

**Correct answer:** E.

**Your answer:** E.

**0** out of **1** point received

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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

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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

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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

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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

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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

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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

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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

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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 `chars` which is terminated with a null character

**Correct answer:** A.

**Your answer:** B.

0 out of 1 point received

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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

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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

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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

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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

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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

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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

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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

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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

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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

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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

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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

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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

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## 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
<b>Total</b>			0