ECED 3403 - Knowledge Survey

5 May 2020

The following survey assesses your knowledge of Computer Engineering as a third-year Computer Engineering student entering ECED 3403. It covers software design, C/C++ programs, microcomputers, assembler language programming, and basic Computer Engineering concepts.

The survey will not be used as part of your course assessment. Dr. Hughes will correct it and return the results to you. The results will be reviewed in an upcoming Team meeting. Aggregate, **not individual**, information may be reviewed by the department.

This survey is testing your knowledge, not what you can look up. Questions must be answered without any assistance from course notes, print or electronic media, or from anyone else. Please respect this request.

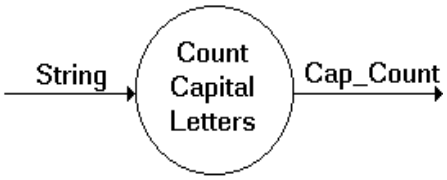
If you are unable to answer a question, that is not a problem, it will allow Dr. Hughes to tailor the course to help you overcome these shortcomings which are no fault of yours.

If you are unsure of an answer, say so, because again, it will allow Dr. Hughes to adapt the course to your needs.

The survey has 25 questions. Please attempt them all. Unless otherwise indicated, assume a sixteen-bit machine. Answers should be clear and concise.

Please type your answers in a Word document or write them on paper and scan the paper, then submit it as an assignment on Brightspace. Allow yourself about one hour.

1. How can we tell if a binary number represents an odd number?
2. Write a set of structured-English instructions for the following process and the supplied data dictionary entry:




```
String = {ASCII character} + NUL
Cap_Count = * Number of capital letters in String *
```

3. At a minimum, what should be stored when an interrupt occurs?
4. How can a number be multiplied by 16 on a machine without a multiplication instruction and without using addition?
5. What is a memory-mapped device?

6. What does the value of the program-counter indicate?
7. What is stored in an interrupt vector?
8. What is a symbol table?
9. Under what conditions is the carry-bit set?
10. When `funcX()` is called, a segmentation fault occurs. What caused it?

```
int *funcX(int value)
{
int *ptr;
*ptr = value;
return ptr;
}
```

11. In the following C/C++ statement, what is the value of DD?

```
enum XX {AA, BB, CC, DD, EE, FF};
```

12. In a function call, where are the arguments stored?
13. What is a Princeton architecture?
14. What is one of the limitations of signed-magnitude arithmetic?
15. What is the output of the following program? (`printf()` is equivalent to `cout <<`.)

```
void func(int x)
{
if (x < 5)
  func(x+1);
printf("%d ", x);
}
main()
{
func(0);
printf("\n");
}
```

16. Rewrite the following code fragment using a single if-else:

```
if (a > b)
  funcA();
else
if (a == b)
  funcB();
else
  funcA();
```

17. What is a register file?
18. What does an interrupt indicate?

19. In a Data Dictionary, what are the possible meanings of:

    ```
    address = street address + city + (province) + (postal code)
    ```

20. Where is a return address stored?
21. What is used to terminate a string a C?
22. What does a dataflow diagram represent?
23. In a machine that only supports addition, how is subtraction performed?
24. What information is carried on a machine's bus?
25. What is the heap?