CS350 Final

Fall 2017

You can answer the questions in either English or Korean, but make them easy to read.

Please read all the questions carefully and answer them with SE keywords.

1. The following is a list of Amazon's SOA strategy

1) All teams will henceforth expose their data and functionality through service interfaces.
2) Teams must communicate with each other through these interfaces.
3) There will be no other form of interprocess communication allowed: no direct linking, no direct reads of another team's data store, no shared-memory model, no back-do1ors whatsoever. The only communication allowed is via service interface calls over the network.
4) It doesn't matter what technology they use. HTTP, Corba, Pubsub, custom protocols -- doesn't matter. Bezos doesn't care.
5) All service interfaces, without exception, must be designed from the ground up to be externalizable. That is to say, the team must plan and design to be able to expose the interface to developers in the outside world. No exceptions.
6) Anyone who doesn't do this will be fired.

(a) Which SE principle is emphasized in this strategy? Name it and justify your answer. (**5 pts**)

(b) Which software quality is emphasized? Name it and justify your answer. (**5 pts**)

(b) Why do you think that Amazon enforces such strategy? Give your answer with respect to software development and maintenance. (**10 pts**)

2. DevOpS can be expressed as in the following figure.

(a) Explain the concept of DevOps. (**5 pts**)

(b) How is DevOps different from a traditional software engineering practice? (**5 pts**)

(c) We discussed in class on that "A development paradigm is evolving towards satisfying SE principles better." Give your thought on this underlined statement whether it can also be applied to DevOps. Please also give a justification on your answer.. (If your answer is 'yes', then explain how DevOps can support which SE principle better. If 'no', explain a major factor that makes this paradigm evolution to happen.) (**10 pts**)

3. The followings are questions on the Cyclomatic Complexity we covered in class:

(a) What is the cyclomatic complexity? Give a definition for it or explain how it is used. (**5 pts**)

(b) Calculate the cyclomatic complexity of the following program. Show your calculation. (**10 pts**)

```
public static void sort(int x []) {
        for (int i=0; i < x.length-1; i++) {
                for (int j=i+1; j < x.length; j++) {
                        if (x[i] > x[j]) {
                                int save=x[i];
                                x[i]=x[j]; x[j]=save
                        }
                }
        }


}
```

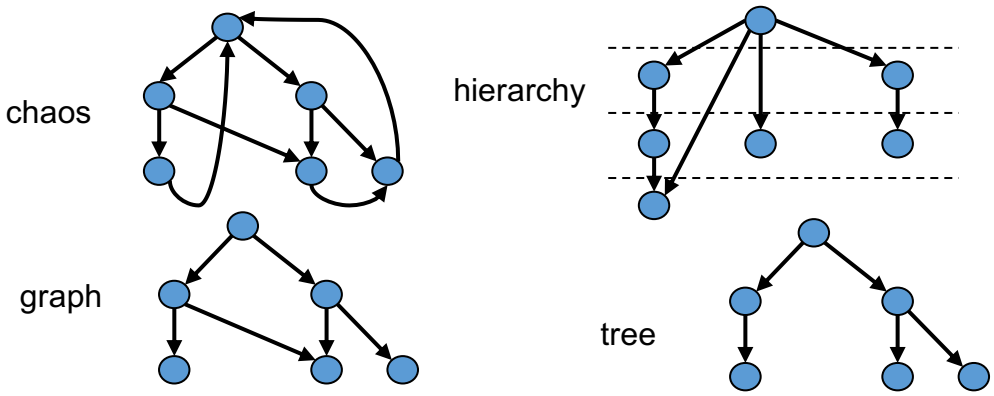
(c) Suppose that you are given a class, C1, as described below:

It consists of three attributes a1, a2, and a3 and four methods, m1, m2, m3, and m4. The attributes are encapsulated within the class and all the methods are declared as public, meaning that their interfaces are known to outside. Devise an idea of calculating the cyclomatic complexity of the class C1. (**10 pts**)

(d) With the class C1 as described above, tell me how you can calculate the cohesion of that class C1. There can be various ways to do so, but give one way of calculating it. If you need to make any assumption on the class C1, please do so. (**10pts**)

4. The following figure shows four different types of the 'call graph'. Devise (or invent) your own ***coupling*** metrics called 'MyCoupling( )' for these four types so that the devised metrics can indicate

the goodness of these types with respect to coupling in this order, MyCoupling(chaos) > MyCoupling(hierarchy) > MyCoupling(graph) > MyCoupling(tree). (**10 pts**.)



5. Suppose that you have two sets of test cases, TS1 and TS2 for testing the same module M. TS1 consists of 1000 test cases (each test case is a pair of test input and expected output) and when you run TS1 over M, you finds 200 errors (Here, an error means a difference between the expected output and real output.) Through tracing the sources of these 300 errors, you find 100 distinguishable defects (bugs) in M. You do the same testing with TS2 consisting of 500 test cases and find 120 errors, and 80 distinguishable defects.

   (a) Test Case Efficiency(TCE) is defined as

   TCE(%) =the number of errors found / the number of test cases to run * 100

   Calculate the TCEs for TS1 and TS2. **(5 pts**)

   (b) Test Effectiveness(TE) is defined as

   TE(%) =the number of defects found / the number of test cases to run * 100

   Calculate the TEs for TS1 and TS2 (**5 pts**)

   (c) Which test set is better between the two? Explain your justification. (**5 pts**)

   (d) Are those two metrics, TCE and TE suitable to measure quality of test sets? Also give a justification to your answer. (**5 pts**)

   (e) This question is not relevant to previous questions from (a) to (d). Robustness is defined as, "when used with regard to computer software, refers to an operating system or other program that performs well not only under ordinary conditions but also under unusual conditions." Please give an idea of doing 'robustness' testing on a program (**10 pts**)

6. Answer the following questions about your team project. (**5 pts)**

(a) Give a description of your team project in one sentence.

(b) What was your main role in your team project?

(c) What was the main difficulty you encountered in your team project