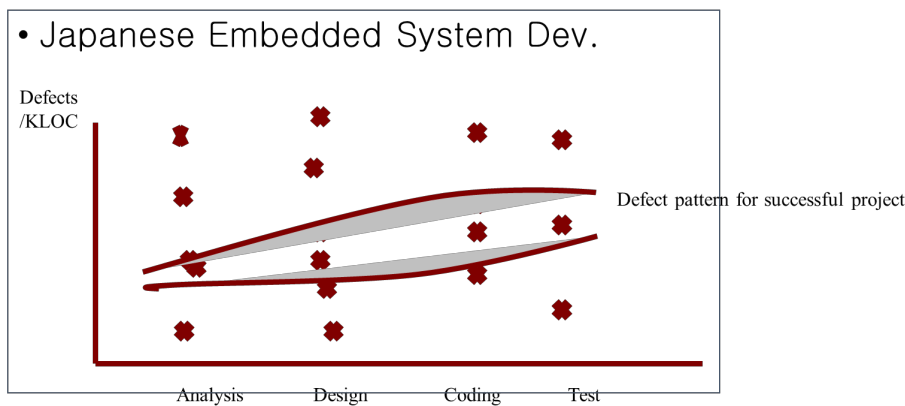# CS350 Final

Spring 2018

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. We discussed in class the following case study of an embedded software system development company.

(a) Explain how this diagram is being used in this company.   (7 pts)

(b) Suppose that I would like implement a similar SPI approach in my software development organization.   What do you need to do first, assuming that your organization's capability is not mature. (8 pts)

(c) How can you relate this quality/process improvement approach to the Chaos Engineering approach in an internet service company such as Netflix?   Any similar concept in both? (5 pts)

2. The following questions are related 'resilient software design patterns'.

(a) What is the major change, occurred in software environment, that resilient software design becomes more important? (5 pts)

(b) Explain how resilient software design patterns are related to 'SE principles'. You need to name a specific resilient pattern and a relevant SE principle to it, with explanation on their relationship. (10 pts)

(c) *"Last weekend's catastrophic failure in BA's computer system threw the travel plans of 75,000 passengers into chaos. What went wrong has become a little clearer - it appears the power somehow went off at a Heathrow data center and when it was switched back on a power surge somehow took out the whole system. Airline bosses insist that this means the whole incident was a power failure not an IT failure - but experts point out that power management is an essential element of any well-planned IT system."*

Suppose that you are a software designer of a new airline reservation system project. What resilient design patterns can you use for avoiding such a failure? Describe your design idea. (10pts)

3. Suppose that you have the following code.

```
i = 0;
n=4;
while (i<n-1) do
  j = i + 1;
  while (j<n) do
    if A[i]<A[j] then
        swap(A[i], A[j]);
    end do;
    i=i+1;
end do;
```

(a) Draw a control flow graph for the code above. (10pts)

(b) How many test cases do we need that satisfy 100% branch coverage? (5 pts)

(c) How many test cases do we need that satisfy 100% path coverage? (5 pts)

(d) Calculate the cyclomatic complexity of the above code. Show steps, (5pts)

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). (10pts)

chaos

hierarchy

graph

tree
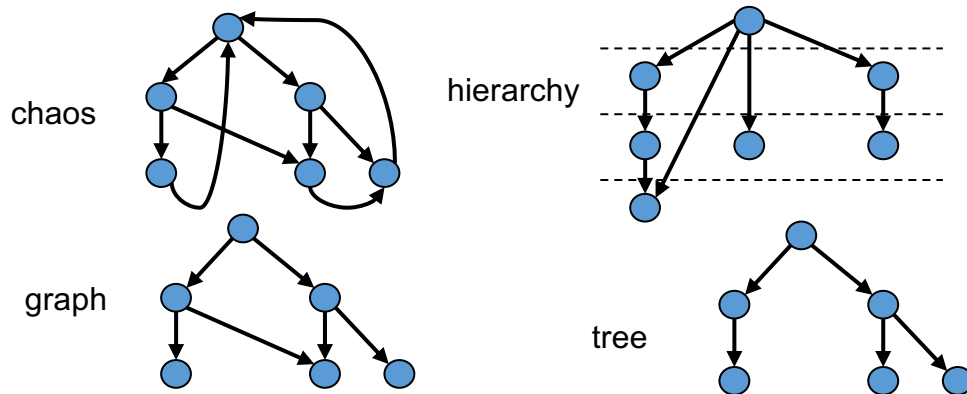
5. Suppose that you have two sets of test cases, TS1 and TS2 for testing the same module M. TS1 consists of 1000 test cases (each test case is a pair of test input and expected output) and when you run TS1 over M, you finds 200 errors (Here, an error means a difference between the expected output and real output.) Through tracing the sources of these 200 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 Effectiveness(TE) is defined as

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

Calculate the TEs for TS1 and TS2 (5pts)

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

(c) Give a specific software system example where the TS1 should be chosen for testing the system over TS2. (5 pts)

6. Answer the following questions about your team project. (10pts)

(a) Thank you for your effort on your team project. By the way, what was the main difficulty you encountered in your team project and how do you solve it?

(b) What did you learn through your team project?