

CS550 Software Engineering

Qualifying exam

June 8, 2012

1. **(25 points)** You are developing a software module, whose main functionality is to calculate $(a+b)/(a-b)$. More specifically, you need to design the module for reading input values, a and b , calculating $(a+b)/(a-b)$, and finally printing the result. Answer only one question from (A) and (B).
 - (A) Draw a Petri-net diagram for the above data flow computation for $X = (a+b)/(a-b)$. Your Petri-net model should be complete and concise in that all the data flow should be shown and all the necessary, but minimal places and transitions be used. Also, make sure to have the initial marking with one token in each (initial) input place for 'a' and 'b', respectively.
 - (B) Draw a DFD and structured chart for this software module.

2. The KAIST Life Insurance Company(KLIC) has developed a software module to calculate the life insurance payment/month based on the age and sex of the insured(피보험자).

The module receives two inputs: the age of the insured in two digits (for instance, input '49' = 49 years old) and sex in one character, 'M' for male, 'F' for female. KLIC calculates the monthly life insurance fee based on the age and sex as follows:

Monthly Insurance Payment(MIP) = age * 1000 KRW
In case of male => MIP * 1.2
In case of age < 20 => MIP * 1.5
In case of age > 65, no insurance policy will be sold.

Perform white-box testing for the above software module. To do so,

*** Please note that to make the problem simple, you may assume that all the input *** values are already verified, meaning that all the valid input values are always given.

 - A. **(15 points)** Draw a control flow graph. You need to make it as simple as possible, but to include all the important control information. Otherwise, you may lose scores in next questions.
 - B. **(15 points)** Develop the smallest set of test cases for 100% statement coverage. You need to show that your test cases satisfy 100% statement coverage criteria, using the control flow graph you drew in A.
 - C. **(15 points)** Develop the smallest set of test cases for 100% path coverage. You need to show that your test cases satisfy 100% path coverage criteria, using the control flow graph you drew in A.

3. **(30 points)**
 - A. Explain the difference between the process quality and product quality
 - B. Explain the 'abstraction' principle.
 - C. Explain the reason why it is important to find defects in early stages of software development.