

# CSE 400 Final

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## I. QUESTION (16 POINTS)

Consider the design patterns with the following examples. For each of example, draw the corresponding UML diagram:

- Composite** The software lifecycle consists of activities which consist of activities or tasks.
- Adapter** Consider realizing the set data structure with the hash table data structure. Hashtable class has the method put, where the corresponding method in the class set is add.
- Bridge** Let say you want to support multiple database vendors such as Xml, JDBC, or stub.
- Proxy** The RealImage is stored and loaded separately. If the RealImage is not loaded, a ProxyImage draws a grey rectangle in place of the image.

## II. QUESTION (12 POINTS)

In a class hierarchy, A is the parent class of B, and B is the parent class of C. B and C can not see the variable a2 of A, but they can see the variable a1 of A. A and C can see the variable b2 of B, but only C can see the variable b1 of B. A and B can see the variable c2 of C but not the variable c1 of C. What are the visibilities of the variables a1, a2, b1, b2, c1 and c2?

## III. QUESTION (14 POINTS)

Write Java code to realize bidirectional many-to-many association between two classes Course and Student.

## IV. QUESTION (15 POINTS)

Design a relational database schema for the following object model: A *League* consists of multiple *tournaments*, where a *tournament* contains multiple *rounds*. A *player* can play in multiple *tournaments* and of course a *tournament* is possible only with multiple *players*. Assume League, Tournament, Player and Round have a name attribute and a unique identifier. Additionally, Tournament and Round have start and end date attributes.

## V. QUESTION (15 POINTS)

In a class hierarchy, A is the parent class of B, C, and D. B is the parent class of E and F. D is the parent class of G. Considering that A is in the top layer, B, C, and D are in the middle layer and E, F, and G are in the bottom layer; apply the following testing strategies.

- Big bang strategy
- Top-to-bottom strategy
- Bottom-up strategy

## VI. QUESTION (12 POINTS)

Assign architectural style names to the following definitions that are given below:

- Subsystems access and modify a single data structure.
- Subsystems are classified into three different types. First group maintain domain knowledge, second group display it to the user, and third group manage the sequence of interactions with the user.
- A subsystem provides services to instances of other subsystems.
- Each subsystem can request and provide services.

## VII. QUESTION (16 POINTS)

Consider the following implementation of the magic() method.

```
public void magic(int N){
    if (N < 0){
        throw new IllegalArgumentException();
        return;
    }
    while (N > 0){
        if (N % 2 == 0)
            System.out.print("0");
        else
            System.out.print("1");
        N = N / 2;
    }
}
```

By exercising all possible paths generate example test cases.