National Univ... Fall 2020 CS Department

Midterm II

28th Nov 2020, 09:00 am – 10:00 am

Course Code: CS 441	Course Name: Design Defects and Restructuring
Instructor Name: Sayed Yousuf	
Student Roll No:	Section No:

Instructions:

- Return the question paper.
- Read each question completely before answering it. There are **8 questions in 3 pages.**
- In case of any ambiguity, you may make assumption. But your assumption should not contradict any statement in the question paper.

Max Marks: 60 points

Time: 60 minutes

Question 1: An example of a Bridge pattern is to design a question paper which has predefined sections. For example, an admission test paper that has Math, Logic and English sections. This becomes the abstraction of the question paper. Now for the implementation we can choose questions for grade 10 students for admission in college. We can choose questions for grade 12 students for admission in a university. Complete your design for this scenario by showing class names and methods within each class. Show how an object of question paper is created for college candidates and another one for university candidates. [5]

Question 2: Suggest which design pattern is applied in scenarios given below. Draw a class diagram for each scenario to show your high-level design with appropriate class names: [20]

A) Every cuisine has a starter, a main course, and a dessert. You need to prepare each item for French and Thai cuisines.

B) You need to prepare complex sandwiches at Subway Restaurant. Each sandwich is made up of different types of bread, meat, vegetables, and sauces. The process of making each sandwich is the same.

C) On your way to office you always stop at a café to buy a cup of coffee. When you enter the café, the serving person knows why you are here but may not know which coffee you will buy today. A cup of coffee is prepared based on your choice for that day.

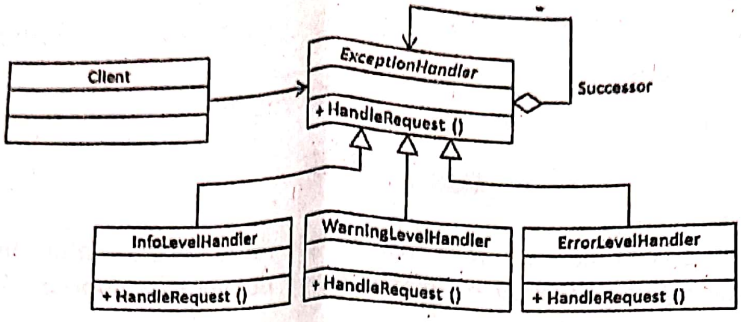
D) For dinner you always have flat wheat bread (roti). You get wheat flour from a shop nearby. Lately you found that there is better and cheaper flour available near your office neighborhood, so you started buying flour from there.

Question 3: Do factory classes always have to be Singleton? Provide strong reasons to support your answer. [5]

Question 4: `BinarySearchTree` is a kind of aggregate class and it can be traversed in three different ways. Design classes showing how those iterators can be created by the aggregate class. Your diagram should include all the necessary elements. [5]

Question 5: The intentions for Adapter and Façade is almost identical. What are the primary differences between both patterns? [5]

Question 6: Write a code for the function `HandleRequest()` In a language of your choice in the pattern Chain of Responsibility for the following classes. Level for Info level handler is less than 30, for Warning level It's less then 60 and for Error level is less than 90. For the level above 90, a System Error will be thrown which will eventually halt the program. [10]



Code for ExceptionHandler is:

```
abstract class ExceptionHandler
{
        protected ExceptionHandler successor;

        public void SetSuccessor(ExceptionHandler successor)
        {
                this.successor = successor;
        }

        public abstract void HandleRequest(Exception exception);
}
```

Code for Main program is:

```
class Program
{
        static void Main(string[] args)
        {
                ExceptionHandler infoHandler = new InfoLevelHandler();
                ExceptionHandler warningHandler = new WarningLevelHandler();
                ExceptionHandler errorHandler = new ErrorLevelHandler();

                infoHandler.SetSuccessor(warningHandler);
                warningHandler.SetSuccessor(errorHandler);

                Exception ex = new Exception(50);
                infoHandler.HandleRequest(ex);
        }
}
```

Question 7: When a SQL query is executed to modify the data by either adding a new data or changing an existing data or deleting the data, the preprocessing and post processing is generally the same or unchanged when it comes to executing different queries. Preprocessing includes setting up or acquiring the database connection, preparing a command, and starting a transaction. Post processing generally includes assigning parameters, executing the query, committing the transaction, and closing the connection. Which design pattern is most likely to be used in this situation? Draw a high-level diagram to show your solution [5]

Question 8: Discuss the concept of reusing a class by inheritance versus delegation of behavior [5]