

Total Marks: 45

Duration: 40 minutes

Student Name:

Student ID:

(For Examiner’s Use Only)

1	2	3	4	5	6

Instructions

1. There are total 6 questions in the script. Make sure all the questions are printed clearly before you start writing.
2. You should answer the all of the questions.

1. Briefly describe, in your own words, the features that distinguish Structural design patterns from other categories of design patterns. [5]

2. What are the key differences between the Abstract Factory pattern and the Factory Method pattern, and when would you choose to use one over the other? Explain your answer with a proper example. [5]

3. Draw the UML diagram for Strategy Pattern & Observer Pattern. [5]

4. Suppose that Stark Industries provides Storage as a Service (STaaS) to the clients. The company provides 2 (two) different types of storage service, including File Storage and Database (DB) Storage. Both of the storage services mainly store and organize data from different client platforms. File storage provides faster performance, but at the cost of expense. Whereas, DB storage provides service at a cheap price, but at the cost of performance. Wakanda University of Engineering and Technology (WUET) is a public technological research university of Wakanda. This university maintains an institutional information system (WIIS), which keeps and manages information of Teachers, Students, and Officers of this institution using 3 (three) different account systems. The authority of WUET wants to receive different storage services from Stark Industries for the WIIS account systems, with the flexibility of changing the type of storage for different account systems. [10]

Now, design a UML class diagram to capture the above scenario, with appropriate structural design pattern and class definitions.

5. Show a class diagram of your designed system using appropriate design pattern for a restaurant software application that lets customers order customized meals online. The restaurant has sandwiches, salads, and wraps on the menu, with various bread, meat, vegetable, and sauce options. Each meal also has different portion sizes and side options. The system should handle all these menu items and customization options. Also, explain your reasoning why your chosen pattern best fits the above scenario. **[10]**

6. For each of the situations below, identify the most specific pattern used in that situation. You need to write the pattern name with sufficient justification. [10]
- a) You need to register a function to be called when a user event happens (like a click on a GUI button).
 - b) You need to try to use several searching algorithms to search a document to get some desired information, but you do not know which searching algorithm will find the desired information.
 - c) You are building a persistence framework for the service layer of a system. In this layer, operations such as changing or deleting objects have to be queued for later execution, and it is also necessary to support the ability to rollback (undo) these operations.
 - d) You are building a game, where the hero character can be *healthy* (Health Point above 30%), *surviving* (Health Point below 30%) or *dead*. When the character is healthy, it allows user to fire bullet at enemies and kill them but every successful hit from the enemies deduct 5 HP from the user. When the character surviving, every successful hit from the enemies deducts 10 HP, and when its HP reaches to 0, the character is dead and the game is over. Health Point (HP) can be gained by eating foods provided in the game.