BBM 486 – DESIGN PATTERNS

2020-21 Spring Final Exam

1. You are asked to improve a banking application, which has a customer class that contain instances of the *checking*, *saving* and *investment* classes, which all implement the IAccount interface. The client is responsible for properly instantiating each of these constituent classes and knowing about all their different attributes and methods. The client classes however would prefer a simple interaction. You want to hide away all the complexity of account management from your customers by building a BankService class, which will act as an entry point to the system.
   (a) Explain which design patterns would you use? **(10 points)**
   (b) Provide your new class diagram and explain. **(10 points)**

2. Suppose you are building an online retail store with global distribution and warehousing. It is important to figure out which warehouse to route to fulfill customer orders. You may run into an issue where you route orders to a warehouse that doesn't have stock for an item in a customer order. You may have to use multiple warehouses to fulfill he order.
   (a) Explain which design patterns would you use. **(10 points)**
   (b) Provide your class diagram and explain. **(10 points)**

3. You are building a 3D printer application that processes print jobs coming from multiple users. The application needs to pool the print requests and serve one-by-one. You have only one 3D printer and need to implement only one instance of the printer pool.
   (a) Explain which design patterns would you use for the printer pool. **(10 points)**
   (b) Provide your class diagram and explain. **(10 points)**

4. You are building a self-driving vehicle application for three vehicles: self-driving trucks, cars and motorcycles. Each vehicle needs to go through similar steps to reach to the destination, such as, accelerating, steering, breaking and checking the traffic to destinations. How would you implement this system?
   (a) Explain which design patterns would you use. **(10 points)**
   (b) Provide your class diagram and explain. **(10 points)**

5. Assume that you are building a vending machine. When a customer inserts money and make a selection the vending machine needs to dispense the item selected. The user however may want his money back if he changes his mind. The application also needs to handle cases when the selected item is out of stock.
   (a) Explain which design patterns would you use. **(10 points)**
   (b) Provide your class diagram and explain. **(10 points)**

6. Assume that you have a pre-existing WebClient that you want to use to talk to another WebService (from a third party). The WebClient expects to send any object into request but the service only supports a JSON object. You are trying to solve this problem.
   (a) Explain which design patterns would you use? **(10 points)**
   (b) Provide your class diagram and explain. **(10 points)**