Bar Code

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Final Exam

Department: Computer Science – Software Engineering Undergrad Program

Course Title: Software Architecture and Design
Course Code: CS 355
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Instructor: Dr Soha Makady
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Exam Duration: 2 Hours

تعليمات هامة

- حيازة التيلفون المحمول مفتوحا داخل لجنة الأمتحان يعتبر حالة غش تستوجب العقاب وإذا كان ضرورى الدخول بالمحمول فيوضع مغلق فى الحقائب.
- لا يسمح بدخول سماعة الأذن أو البلوتوث.
- لايسمح بدخول أي كتب أو ملازم أو أوراق داخل اللجنة والمخالفة تعتبر حالة غش.

Question	Mark	Signature
One		
Two		
Three		
Four		
Five		
Six		
Seven		
Eight		
Nine		
Ten		
Total Marks		

_____

60

Total Marks in Writing: _____

This exam is a CLOSED book exam.
The exam comes in 8 pages (including the cover page).

Question 1 [9 marks]

A. Among the object-oriented principles discussed in the course, was “Code to an interface rather than to an implementation”. **Give an example** to illustrate that principle. Your example needs to show how you code to an implementation versus how you code to an interface **[4]**.

B. Explain the difference between prescriptive architecture and descriptive architecture **[2]**.

C. Explain the difference between software architecture and software design **[2]**.

D. Provide **an example** for a decision that would be classified as non-architectural design decisions **[1]**

Question 2 [4 marks]

Categorize each of the following requirements **according to the sub-categories** of non-functional requirements explained within the course. You must provide a written explanation for your answer. ***If no explanation is provided, no mark will be given for the corresponding part.***

(a) The system must use the existing Apache Tomcat web server and use Java Server Pages (JSP) technology to process web requests. _____

(b) For the FCI's new e-com system, students should know about 90% of the provided features after using the system for 3 full days. _____

(c) For the FCI's new e-com system, one student should not be able to view the grades of another student. _____

(d) Fawry electronic payment for mobile phone bills of Etisalat should support 3000 payments per second all over Egypt. _____

Question 3 [12 marks]

(a) **[4 marks]** Consider the following source code:

```
public class Product {
String name;
   public void setName(String name) {
   this.name = name;
   }
   public String getName() {
      return name;
   }
   //Save to database code.
   public void Save(){
      //Open db connection.
      //Make some logic.
      //DB SAVE operation.
      //Close connection.
   }
}
```

i. Which design principle is violated in the code above? You **must** justify your answer by an explanation.

ii. Modify that source code to properly apply the violated principle. You need to re-write the complete source code.

(b) [**8 marks**] Consider that you are required to design a software system to display and print shapes from a database. The type of resolution to use to display and print the shapes depends on the hardware configuration of the computer on which the software system is running. If the computer has **low configuration**, the software system should use a **low**-resolution display driver (**L**RDD) to display the shapes and a **low**-resolution print driver (**L**RPD) to print the shapes. If the computer has a **high configuration**, the software system should use a **high**-configuration display driver (**H**RDD) to display the shapes and a **high**-resolution print driver (**H**RPD) to print the shapes. **Sketch** a class diagram for the software system while **using the abstract factory design pattern** and **explain** your solution. The diagram should clearly show the attributes/operations/relationships as applicable.

Question 4 [12 marks]

Consider Eclipse IDE (integrated development environment) that you usually use to develop your Java projects within programming courses. Such IDE provides several different views for the same file. For example, if you open your Java project “Sprint 1” within Eclipse IDE, you will find the file “Customer.java” represented within the **Project view**, and within the **Inheritance hierarchy view**, and within the **FileInfoView**. If you rename of file “Customer.java” to “User.java”, those three views should reflect the renaming of that file, and how the new file name instead. Furthermore, the ProjectView allows creating Java files and Java packages. However, a Java package can contain Java files, Java packages, or a combination of both. **Sketch one** class diagram to model the above-explained features of Eclipse IDE after applying the needed design pattern(s). The diagram should clearly show the attributes/operations/relationships as needed. **Justify** why you selected each pattern(s).

Question 5 [14 marks]

Talabaty is an online food ordering website. Talabaty allows **customers** to search for restaurants or browse existing restaurants. However, for the searching feature to work properly, the searching needs to retrieve the complete restaurant information from a restaurants repository that holds all the information of the different restaurants that have a written agreement with Talabaty to be part of their system. Customers are also allowed to add several meals to their meal order. For the meal ordering process to succeed, the meal ordering process demands validating the customer's credit cards through a third-party (ready-made component). Talabaty **employees** should be able to add/remove restaurants, to add/remove offers for different restaurants to the restaurants repository, to update resturants' information, and to identify which restaurant are part of current customers' meal orders. To identify the restaurants that are parts of existing orders, the identification needs to retrieve orders information from an orders repository that holds all the current/past meal orders. Customers can make their orders through Talabaty mobile application, or through a web-based browser.

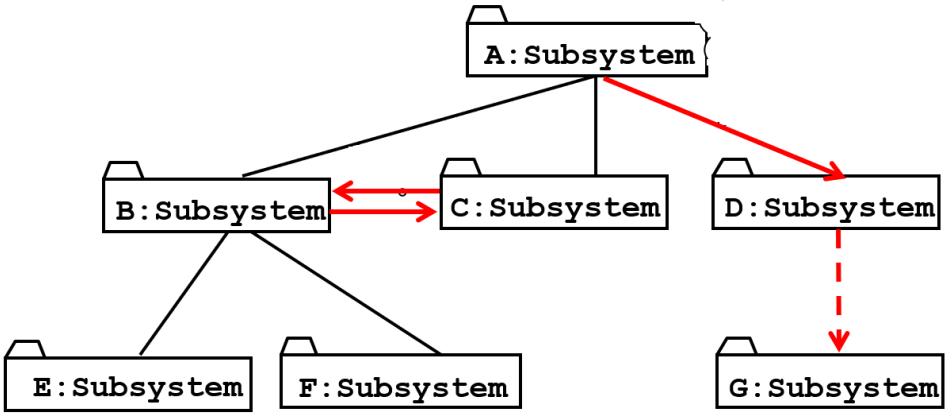
(a) **[6 marks]** Create a component diagram showing the main components of the above system. Your diagram should show the components, and the component interfaces as well using the UML notations.

(b) **[2 marks]** For **one component** from part (a), you need to **mention** the services that it provides and **provide** their corresponding APIs.

(c) **[6 marks]** Create a deployment diagram for the above system. Your diagram should utilize information from part (a) as needed to completely reflect the describe system while using the UML notations.

Question 6 [9 marks]

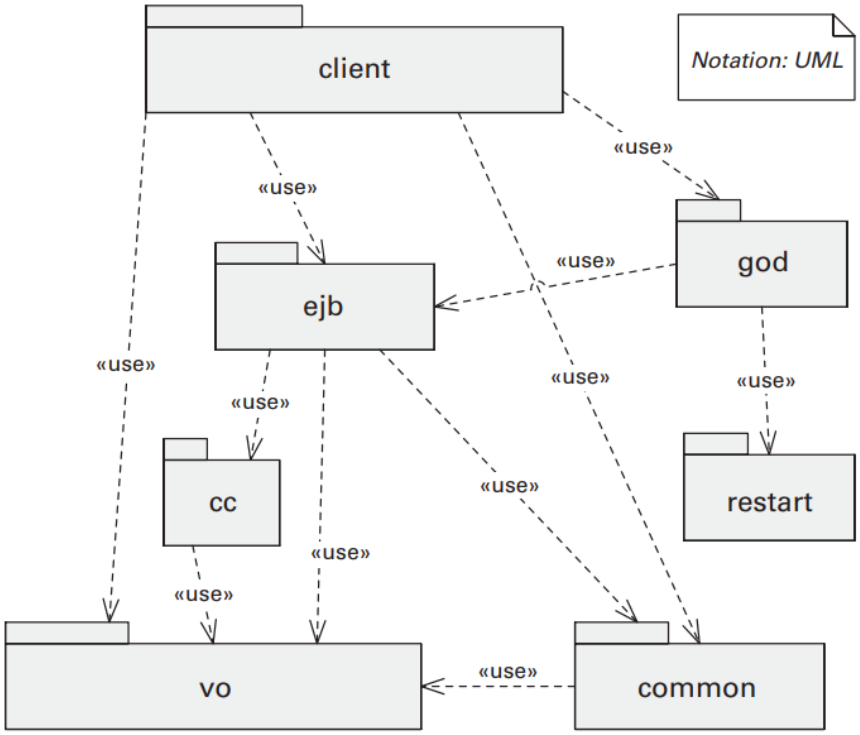
(a) Consider the below figure.



i. Within the lectures, the concepts of layer and partition were explained. Explain how those two concepts fit within the above diagram **[2]**.

ii. Explain the relationships that can exist between layers, while giving an example for each **[3]**.

(b) Consider the following architectural view for some system.



i. Using plain English words, explain this view. Your explanation needs to cover all of the notations used within the diagram **[2]**.

ii. Use the above view to explain the order in which the developers can proceed with incremental development of that system. You need to mention the exact flow of incremental development **[2]**

End of Exam