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P. Pages : 3

Time : Three Hours



**NJR/KS/18/4546**

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
  2. Solve Question 1 OR Questions No. 2.
  3. Solve Question 3 OR Questions No. 4.
  4. Solve Question 5 OR Questions No. 6.
  5. Solve Question 7 OR Questions No. 8.
  6. Solve Question 9 OR Questions No. 10.
  7. Solve Question 11 OR Questions No. 12.
  8. Assume suitable data whenever necessary.
  9. Illustrate your answers whenever necessary with the help of neat sketches.

- |    |     |   |   |
|----|-----|---|---|
| 1. | a)  | What is a Design Pattern? Explain the format for describing a design pattern. | 8 |
|    | b)  | Explain the meaning of following OOP principles:                              | 6 |
|    | i)  | "Favor object composition over class inheritance"                             |   |
|    | ii) | "Program to an interface, not an implementation."                             |   |

OR

- |           |    |  |           |
|-----------|----|--|-----------|
| <b>2.</b> | a) | List and explain any 4 design problems. Also explain how design patterns solve these design problems faced by object – oriented software designers.  | <b>8</b>  |
|           | b) | compare and contrast the code reusability techniques: Inheritance and Composition.   | <b>6</b>  |
| <b>3.</b> | a) | Consider a business case of a chocolate factory which has a computer controlled chocolate boiler. The job of a boiler is to take in chocolate and milk, bring them to boil and then pass them on to next phase. Following class diagram represents chocolate Boiler class. | <b>13</b> |

Chocolate Boiler
boolean empty boolean boiled
Chocolate Boiler () Void fill () Void drain () Void boil () boolean is Empty () boolean is Boiled ()

The company uses a single chocolate Boiler for its operations. Use appropriate design pattern to create a chocolate Boiler class and a single object. Also illustrate different ways to make this class safe from multithreading.

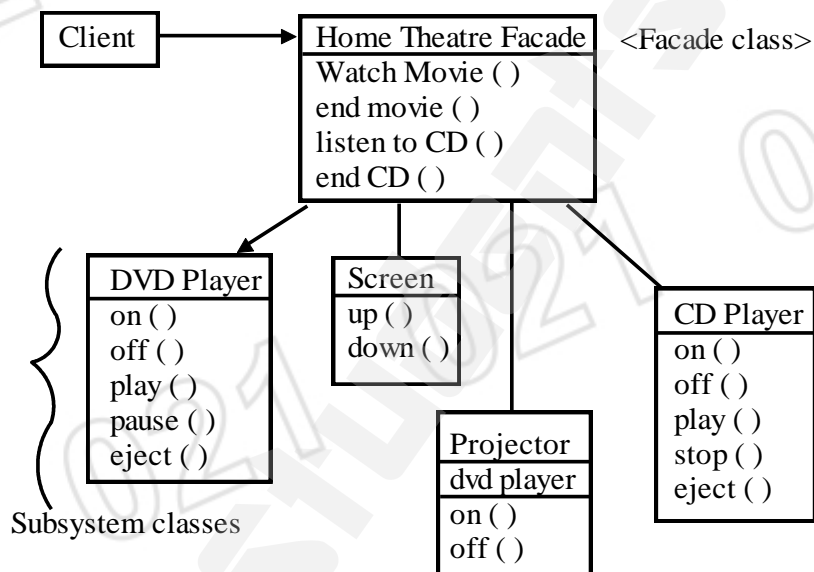
**OR**

4. a) Explain the applicability of Builder design pattern. Illustrate a scenario in which builder pattern can be used. 6
- b) Consider a business case of a Pizza store. The Pizza store has started its two Franchisies specific for regional preferences. One franchise makes Indian style pizzas and the other makes American style Pizzas. 7

Indian pizza store makes a variety of Indian style pizzas like cheese Pizza, veggie pizza and clam Pizza. American pizza store also makes same pizzas but in American style. A client requests for a pizza by calling a method "order Pizza ( )" defined in Pizza store.

For the given scenario, identify the creator class and the product class and design an appropriate class diagram using "Factory Method" design pattern.

5. a) Differentiate between Decorator and adapter design patterns. 5
- b) For the given class diagram, write a program to implement facade design pattern. 9



for each method in the facade, use the objects and methods of the subsystem appropriately

OR

6. a) Explain the intent, applicability, structure and consequences of composite design pattern. 7
- b) Demonstrate with a suitable example, the use of proxy design pattern. Also explain its advantages and drawbacks. 7
7. a) A Purchase request approval system is to be designed for a college. Different types of purchase request include 13
- 1) Stationary requirement
  - 2) Staff table requirement
  - 3) Staff computer requirement
  - 4) Lab setup requirement

Request of type 1 can be approved by a clerk. Request type 2 and 3 can be approved by Head of the department and type 4 can be approved by principal. Design a class diagram using an appropriate design pattern. Also implement a program to illustrate your design.

OR

8. a) The recipe for preparing tea is as follows: 7  
1) Boil water  
2) Put tea bag in boiled water  
3) Pour in cup  
4) Add lemon  
The recipe for preparing coffee is as follows  
1) Boil water  
2) Brew coffee in boiled water  
3) Pour in cup  
4) Add milk and sugar  
Identify the code duplication in above procedures of preparing tea and coffee. Use template method pattern to remove this code duplication and draw the resultant class diagram.
- b) Explain the features of behavioral design patterns. 6
9. a) List and explain various design problems in document editor design. 7  
b) Explain how does recursive composition help to compose a document out of simple graphical elements. 6

**OR**

10. a) Explain in detail how Abstract Factory Pattern helps to support multiple look-and – feel for a Document editor. Illustrate the answer with GUI Factory class hierarchy. 8  
b) Which design pattern provides undo/redo capability in document editor? Describe the procedure in brief. 5
11. a) Explain how design patterns help to reduce complexity of a design. 6  
b) List and illustrate the use of various design patterns in game design. 7
- OR**
12. a) What are the methods used to analyze the complexity of design patterns? Explain in detail. 7  
b) Explain the applications of design patterns in product design. 6

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**It's hard to beat a person who never gives up.**

**~ Babe Ruth**

