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> # IT'S HARD TO BEAT A PERSON WHO NEVER GIVES UP.
>
> Babe Ruth, American professional baseball player

B.E.Sixth Semester (Computer Science Engineering) (C.B.S.)

Design Patterns

P. Pages : 3

Time : Three Hours

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Max. Marks : 80

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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)   Select an appropriate answer for the following multiple choice questions.

   i)   Which of the following is not true about a design pattern ?   **1**
   a)   Design pattern is a data structure
   b)   Design pattern is a core of solution to a problem
   c)   Both A and B
   d)   None of these

   ii)   Design patterns are classified on the basis of -   **1**
   a)   Purpose   b)   Scope
   c)   Both A and B   d)   None of these

   iii)   The scope of inheritance is limited to ----------- and is defined -----------.   **1**
   a)   Object, dynamically   b)   Class, dynamically
   c)   Object, statistically   d)   Class, statistically

   iv)   Which of the following is not a section in design pattern description ?   **1**
   a)   Motivation   b)   Domain
   c)   Consequences   d)   Related Patterns

   v)   A ---------- class provides an optional interface or functionality to other classes.   **1**
   a)   Augmented class   b)   Concrete class
   c)   Hybrid class   d)   Mixin class

   b)   What is a design pattern ? Explain the classification and catalog of design pattern.   **8**

OR

2.   a)   According to an OOP principle, we should "Favor object composition over class inheritance". Justify the given principle.   **5**

   b)   List the common causes of redesign of an existing system.   **4**

   c)   Explain in short several approaches to find an appropriate design pattern to solve a problem.   **4**

3. a) Differentiate between factory method and Abstract factory design patterns. **4**

b) Explain the features of creational design patterns. **4**

c) Explain the situations where we can use following listed design patterns : **6**
   i) Builder design pattern
   ii) Prototype design pattern

OR

4. a) An interactive role playing game is to be designed in which a hero needs to reach to his destination. On the way, the hero encounters a large number of monsters. It is expected to evolve a monster as the landscape changes - for example, for land, a land monster is required for water, a fish monster and for air a bird monster is required. As the landscape changes dynamically, you need to change (create) appropriate monsters while the game is running. Identify a suitable design pattern to handle the dynamic creation of different objects and to reduce the overhead creating same objects repeatedly. Justify your answer and draw a class diagram for the solution. **9**

b) Explain the different ways for making a singleton class thread safe. **5**

5. a) Consider an example of a Duck simulation application which uses Duck objects. A Duck class is represented as follows : **14**

Duck
quack ( )
fly ( )

Due to some reason, the number of duck objects are limited and hence it is decided to use a Turkey in place of Duck. A Turkey class is represented as follows :

Turkey
gobble ( )
fly ( )

A turkey cannot directly replace a duck because their operations are different. Design a Turkey adapter' class using Adapter design pattern and use this class to make a turkey object perform duck operations. Also, explain the advantages and disadvantages of Adapter design pattern.

OR

6. a) Explain the bridge design pattern in terms of its intent, applicability, structure and consequences. **7**

b) A coffee shop makes different types of coffees like expresso, Decaf, Darkroast and Mocha. Alongwith these beverages it also offers a variety of toppings used to top on the coffee. Different toppings available are Chocolate, Cream & Milk. A coffee can be topped with any combination and any number of toppings. Design a solution which will be capable of making any type of coffee with a variety of toppings on it. (Use decorator design pattern to decorate a coffee with toppings) **7**

7. a) Compare state and strategy design patterns in terms of their intent, motivation, applicability, consequences, collaborations and structure. **6**

b) A restaurant offering breakfast menu has decided to merge with other restaurant that offers lunch menu. The existing implementation of both the restaurant's systems are different. Both the systems use same representation of a menu item which is **7**

MenuItem
price : double
name : string
getPrice ( )
getName ( )

The breakfast menu is represented using breakfastmenu class and lunch menu is represented using lunchmenu class. Breakfast menu uses an Arraylist to store list of menu items whereas lunchmenu uses an array to store menuitems.

Define an <u>Iterator</u> class using iterator design pattern in order to encapsulate iteration of BreakFastMenu.

OR

8. a) Match the following design patterns with the design aspects that design patterns let you vary. **4**

A)	Strategy	i)	Grammar & interpretation of language
B)	State	ii)	An algorithm
C)	Mediator	iii)	States of object
D)	Interpreter	iv)	How and which objects interact with each other

b) Suppose that you want to time travel to any era of your life. Current time for your life is represented by a "<u>time</u>" attribute in your "<u>life</u>" class. Which is the best suitable design pattern to restore your life to a previous time. Justify your answer. **4**

c) Explain observer design pattern's intent, motivation, consequences and applicability. **5**

9. a) List and describe the seven design problems that arise in Document editor's design. **7**

b) How can we represent hierarchically structured information in a document editor ? Illustrate with example. **6**

OR

10. a) Which design pattern helps to encapsulate the formatting algorithm ? Explain in detail. **7**

b) Explain in detail, use of Abstract factory pattern to support multiple look-and-feel standards for document editor. **6**

11. a) What is the use of various design patterns in game design. **7**

b) Explain the methods used to analyze the complexity of design patterns. **6**

OR

12. a) Explain how design patterns help to reduce complexity of a design. **6**

b) Explain applications of various design patterns in product design. **7**

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High expectations are the key to everything.

~ Sam Walton

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