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1. a) What are design pattern? List documented design patterns. 6
- b) What are the different types of Design patterns? 7

OR

2. a) Explain the various elements of Design pattern. 7
- b) Explain characteristics of Design patterns. 6
3. a) Explain the difference between Factory method and Abstract factory Design pattern. 6
- b) Explain the concept of prototype Design pattern with suitable example. 7

OR

4. a) Explain singleton design pattern with suitable example. 7



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- | | | | |
|----|----|---|---|
| 4. | a) | Explain singleton design pattern with suitable example. | 7 |
| | b) | Explain Builder Design pattern along with its practical implementation. | 6 |
| 5. | a) | What is the working strategy of Adaptor Design pattern. | 7 |
| | b) | Explain proxy Design pattern with suitable example. | 7 |

OR

- | | | | |
|----|----|---|---|
| 6. | a) | Explain the working of Bridge Design pattern with example. | 8 |
| | b) | Explain command Design pattern also explain its advantages and disadvantages. | 6 |
| 7. | a) | Explain observer Design pattern alongwith its advantages and disadvantages. | 7 |
| | b) | Explain working of visitor Design pattern with example. | 6 |

OR

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8. a) Match the following Design patterns with the design aspects that design patterns let you vary. **4**
- | | |
|----------------|--|
| a) Strategy. | i) Grammar and interpretation of Language. |
| b) State | ii) An algorithm. |
| c) Mediator | iii) States of object. |
| d) Interpreter | iv) How and which object interact with each other. |
- b) Explain strategy Design pattern along with it's applicability. **6**
- c) Explain the concept of chain of responsibility design pattern. **3**
9. a) What are design problems? List the design problem for document editor application. **7**
- b) Explain the concept of recursive composition with example. **6**
- OR**
10. a) Which design pattern is suitable for spelling checking and hyphenation? Explain it with example. **7**

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10. a) Which design pattern is suitable for spelling checking and hyphenation? Explain it with example. 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 design complexity? Explain its types. 7
- b) Explain methods to analyze the complexity of Design pattern. 7
- OR**
12. a) Explain case study of game design. 7
- b) Explain how design patterns helps for product Design. 7

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1. a) Explain the concept of software reusability used in design patterns. 7
- b) Describe the elements of design pattern. 6

OR

2. a) Explain the characteristics of design pattern. 7
 - b) Explain the applications of design patterns. 6
3. a) Explain the concept of prototype design pattern with suitable example. 7
 - b) What are the characteristics of creational design patterns. 6

OR

4. a) Explain the applicability of Builder design pattern. Illustrate a Scenario in which builder pattern can be used. 7

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4. a) Explain the applicability of Builder design pattern. Illustrate a Scenario in which builder pattern can be used. 7
- b) Explain where singleton design pattern play an important role along with its advantages and disadvantages. 6
5. a) Explain the role of structural design pattern in object oriented design. 7
- b) Differentiate between Decorator and adapter design patterns. 6

OR

6. a) How to implement composite design pattern explain with suitable example. 7
- b) Demonstrate with suitable example, the use of proxy design pattern. Also explain its advantages and drawbacks. 6

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7. a) Explain the observer design pattern with suitable example.

7

b) Explain the Memento design pattern with suitable example.

7

4

OR

8. a) Explain the features of behavioral design patterns.

7

b) Explain the visitor design pattern with suitable example.

7

9. Explain the overall case study of document editor with proper example.

13

OR

10. a) Explain how design patterns can be used for Document structure, formatting and Embellishing the user interface.

8

b) Discuss spelling checking and hyphenation in Document editor.

5

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11. a) Explain the product design process.

7

b) What is design complexity? Explain its types.

7

OR

12. a) Explain case study of Game design.

7

b) Explain the application of design pattern in product design.

7

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1. a) Describe the elements of design pattern. 6
- b) i) Abstract factory is also known as 1
- ii) Match the following. 4
- | | |
|--------------------|------------------------|
| 1. Abstract | a. Wrapper |
| 2. Factory method | b. Handle/Body |
| 3. Adopter pattern | c. Kit |
| 4. Bridge pattern | d. Virtual constructor |
- iii) Which of the following is not a section in design pattern description? 2
- | | |
|-----------------|---------------------|
| a) Motivation | b) Domain |
| c) Consequences | d) Related patterns |

OR

2. a) Explain design pattern. List all design patterns and its classification. 7

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2. a) Explain design pattern. List all design patterns and its classification. 7
- b) Explain usage of design pattern with proper example. 6
3. a) Explain the concept of prototype design pattern with suitable example. 7
- b) Define Intent, Also known as, Applicability sample code of bridge design pattern with example. 6

OR

4. a) Explain where singleton design pattern plays an important role along with its advantages and disadvantages. 7
- b) Explain abstract factory design pattern with class diagram. 6

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5. a) Explain Adapter design pattern in terms of its intent, applicability, structure and consequences. 7
- b) Where to use Decorator design pattern explain with example. 6

OR

6. a) How to implement composite design pattern explain with suitable example. 7
- b) Explain the role of structural design pattern in object oriented design. 6
7. a) Illustrate the notion of command design pattern with suitable example. 7
- b) Explain template method design pattern with class diagram implementation. 7

OR

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

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8. a) Match the following design pattern with the design aspects that design patterns let you vary. **4**
- | | |
|----------------|--|
| a) Strategy | i) Grammar & interpretation of long |
| b) State | ii) An algorithm |
| c) Mediator | iii) States of object |
| d) Interpreter | iv) How and which object interact with each other. |
- b) Explain observer design pattern intent, motivation, consequences and applicability. **4**
- c) Explain mediator design pattern in terms of intent, structure, usage and applicability. **6**
9. a) Which design pattern is suitable for supporting multiple look-and-feel standards. Explain with example. **7**
- b) Explain the concept of embellishing the user interface. **7**

OR

10. a) List and explain the seven design problem for document editor application. **7**

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10. a) List and explain the seven design problem for document editor application. 7
- b) Which design pattern is help for spelling checking and hyphenation problem. 7
11. a) What are design complexities? List the design complexities. 7
- b) Explain the design pattern application for gaming. 6

OR

12. a) Explain methods to analyze the complexities of design pattern. 7
- b) Explain the product design and its application. 6

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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

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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 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 4

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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

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9

3. a) Differentiate between factory method and Abstract factory design patterns. 4
- b) Explain the features of creational design patterns. 4



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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

10

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

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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

class is represented as follows :

Duck
quack ()
fly ()

Due to some reason, the number of duck objects are limited and hence it is decided to use a

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5. a) Consider an example of a Duck simulation application which uses Duck objects. A Duck 14

class is represented as follows :

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.

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6. a) Expl in the bridge design pattern in terms of its intent, applicability, structure and consequences. 7
- b) A coffee shop makes different types of coffees like espresso, Decaf, Darkroast and Mocha. 7
- 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. a) Compare state and strategy design patterns in terms of their intent, motivation, applicability, consequences, collaborations and structure. 6

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- 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 Iterator 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

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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 "time" attribute in your "life" 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? 6
- Illustrate with example.

11

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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? 6
Illustrate with example.

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

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- b) How can we represent hierarchically structured information in a document editor ?

6

Illustrate with example.

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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1. a) What is Design Pattern? List all design patterns and it's classification. 7
- b) Describe the elements of design pattern. 6

OR

2. a) Explain the characteristics of design pattern. 7
- b) Explain usages of design pattern with proper example. 6
3. a) Illustrate the notion of bridge design pattern with example. 7
- b) Explain the concept of prototype design pattern with suitable example? 7

OR

4. a) Explain abstract factory design pattern with class diagram. 7
- b) Explain where singleton design pattern play an important role along with it's advantages 7

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4. a) Explain abstract factory design pattern with class diagram. 7
- b) Explain where singleton design pattern play an important role along with its advantages and disadvantages. 7
5. a) Explain the role of structural design pattern in object oriented design. 7
- b) Explain working of Adapter design pattern with its applications. 6

OR

6. a) Where to use Decorator design pattern explain with example. 7
- b) How to implement composite design pattern explain with suitable example. 6

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7. a) Explain working of visitor design pattern with example. 7
b) Explain observer design pattern along with its advantages and disadvantages. 7

OR

8. a) Explain working of Memento design pattern with it's applications. 7
b) Draw a class diagram for Template method and explain working of Template method with suitable example. 7
9. a) Explain the overall case study of document editor with proper example. 13

OR

- 10 a) Write a short note on. 13
i) Supporting multiple look-and-fell standard in document editor.
ii) Spelling checking & hyphenation.

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10 a) Write a short note on.

13

- i) Supporting multiple look-and-fell standard in document editor.
- ii) Spelling checking & hyphenation.
- iii) User operation.

11. a) What is design complexity? Explain its types.

7

b) Explain methods to analyze the complexity of design pattern.

6

OR

12. a) Explain case study of Game design.

7

14

b) Explain the application of design pattern in product design.

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- | | | | |
|----|----|---|---|
| 1. | a) | What is design pattern? List down all design patterns and their classification? | 7 |
| | b) | Explain usage of design pattern with example. | 6 |

OR

- | | | | |
|----|----|---|---|
| 2. | a) | Explain the various elements of design pattern. | 7 |
| | b) | Explain properties of design patterns? Also explain the advantages of design pattern. | 6 |
| 3. | a) | Write and explain singleton design pattern with suitable example. | 7 |
| | b) | Explain the difference between factory method and abstract factory design pattern. | 6 |

OR

- | | | | |
|----|----|---|---|
| 4. | a) | Explain prototype design pattern along with its practical implementation. | 7 |
|----|----|---|---|

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|----|----|---|---|
| 4. | a) | Explain prototype design pattern along with its practical implementation. | 7 |
| | b) | Differentiate between abstract factory and builder design pattern. | 6 |
| 5. | a) | What is the working strategy of adapter design pattern. | 7 |
| | b) | Explain decorator design pattern along with its advantages. | 7 |

OR

- | | | | |
|----|----|---|---|
| 6. | a) | Illustrate the notion of flyweight design pattern with example. | 7 |
| | b) | Where to use proxy design pattern? Also explain its advantages and disadvantages. | 7 |

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|----|----|--|---|
| 7. | a) | Explain command design pattern? Also explain its advantages and disadvantages. | 7 |
| | b) | What is observer pattern explain its implementation. | 7 |

OR

- | | | | |
|----|----|---|---|
| 8. | a) | Explain strategy design pattern along with its applicability. | 7 |
| | b) | Illustrate the concept of visitor design pattern with example. | 7 |
| 9. | a) | Explain the different design problem in Lexi's document editor. | 7 |
| | b) | Explain the concept of recursive composition with example. | 6 |

OR

- | | | | |
|-----|----|---|---|
| 10. | a) | Which design pattern is suitable for spelling checking and hyphenation explain it with example. | 7 |
| | b) | Explain the concept of embellishing the user interface | 6 |

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|-----|----|---|---|
| 10. | a) | Which design pattern is suitable for spelling checking and hyphenation explain it with example. | 7 |
| | b) | Explain the concept of embellishing the user interface. | 6 |
| 11. | a) | What is software complexity? Explain its type. | 7 |
| | b) | What are the applications of design pattern in game design. | 6 |

OR

- | | | | |
|-----|----|--|---|
| 12. | a) | State different methods to analyze the complexity of design pattern. | 7 |
| | b) | Explain the application of design pattern in product design. | 6 |

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1. a) What do you mean by Design Patterns? Explain with suitable example. 7
- b) Explain the concept of software reusability used in design patterns. 6

OR

2. a) What are the different types of Design Patterns? 6
- b) Explain the applications of design patterns. 7
3. a) Consider a business case of fast-food restaurant where a typical meal could be a burger and cold drink. Burger could be either a veg burger or chicken burger and will be packed by a wrapper. Cold drink could be either a coke or Pepsi and will be packed in a bottle. Draw a class diagram to implement this business case using a Builder Design Pattern. 10
- b) What are the characteristics of creational design patterns? 4

OR

4. a) Explain singleton design pattern with suitable example. 7

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- | | | | |
|----|----|---|---|
| 4. | a) | Explain singleton design pattern with suitable example. | 7 |
| | b) | Explain abstract factory pattern with suitable example. | 7 |
| 5. | a) | Explain the significance of Bridge design pattern in object oriented programming. | 7 |
| | b) | Explain the flyweight design pattern with suitable example. | 6 |

OR

6. Consider an example in which an audio player device can play mp3 files only and wants to use an advanced audio player capable of playing VLC and mp4 files. Create an interface 'Media Player' and concrete class 'Audio Player' implementing the Media Player interface 'Audio Player' can play mp3 format audio files by default. Use adaptor design pattern to implement this design pattern. **13**

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7. a) Explain the observer design pattern with suitable example. 7
b) Explain the Memento design pattern with suitable example. 6

OR

8. a) Explain command design pattern with suitable example. 7
b) Explain Interpreter design pattern with suitable example. 6
9. a) Discuss the design problems of designing a Document editor. 7
b) Explain the supporting of Multiple Look-and-feel standards. 7

OR

10. a) Explain how design patterns can be used for Document structure, formatting and
Embellishing the user interface. 9

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10. a) Explain how design patterns can be used for Document structure, formatting and
Embellishing the user interface. 9
- b) Discuss spelling checking and hyphenation in document editor. 5
11. a) Which techniques are used for complexity analysis of design patterns. 7
- b) Explain the product design process. 6

OR

12. a) Discuss complexity analysis of design patterns. 7
- b) Explain applications of design pattern in game design. 6

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