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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: V - THEORY EXAMINATION (2025 - 2026)

Subject: Design Patterns

Time: 3 Hours

Max. Marks: 100

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C**. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.

2. Maximum marks for each question are indicated on right -hand side of each question.

3. Illustrate your answers with neat sketches wherever necessary.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A

20

1. Attempt all parts:-

- 1-a. Choose the correct option from the following statements about Design Pattern: (CO1, K2) 1
- (a) They capture proven solutions to recurring problem
 - (b) They improve reusability and maintainability of code
 - (c) All the above
 - (d) They make system design more flexible and extensible
- 1-b. Which of the following is true in respect to ViewState (CO1,K2) 1
- (a) ViewState is used to preserve page and control values between postbacks
 - (b) ViewState stores data on the server
 - (c) ViewState is accessible only by the database
 - (d) ViewState is not maintained across postbacks
- 1-c. The Abstract Factory pattern is not suited for which situation? (CO2, K3) 1
- (a) When the product creation logic is not complex
 - (b) When objects need to be created without specifying their concrete classes
 - (c) When you want more than one instance of a class
 - (d) When you need to copy an object at runtime
- 1-d. Judge the suitability of Singleton in cloud applications. (CO2,K3) 1
- (a) Best for distributed systems
 - (b) Can cause synchronization issues
 - (c) Ideal for multiple instances
 - (d) Provides no benefits

- 1-e. Most user interface design patterns fall within one of ____ categories of patterns. (CO3, K2) 1
- (a) 5
 - (b) 10
 - (c) 25
 - (d) 100
- 1-f. Pattern provides a single class which provides simplified methods required by client and delegates call to those methods: (CO3,K2) 1
- (a) Adapter pattern
 - (b) Builder pattern
 - (c) Facade pattern
 - (d) Prototype pattern
- 1-g. Select the correct use of design pattern. (CO4, K2) 1
- (a) Architectural Styles and Programming Idioms
 - (b) Mid-Level Design Patterns
 - (c) Data Structures and Algorithms
 - (d) All of the mentioned
- 1-h. Elaborate which of the following involves breaking of complex supplier into parts with a broker presenting a uniform interface to the client and deciding how to route client requests. (CO4,K3) 1
- (a) Simplify the Supplier
 - (b) Decompose the supplier
 - (c) Facilitate Client/Server interface
 - (d) All of the mentioned
- 1-i. False statement for broker is __. (CO5,K3) 1
- (a) Simplify the Supplier
 - (b) Decompose the supplier
 - (c) Facilitate Client/Server interface
 - (d) All of the mentioned
- 1-j. Name the pattern that features a client that needs a service from a supplier, but there is some problem with the supplier providing the service: (CO5, K2) 1
- (a) Broker
 - (b) Iterator
 - (c) Generator
 - (d) Reactor
2. Attempt all parts:-
- 2.a. Explain the MVC design pattern. (CO1,K2) 2
- 2.b. Evaluate the limitations of Prototype when applied in memory-intensive applications. (CO2,K2) 2
- 2.c. Explain the applicability of the decorator pattern. (CO3,K3) 2
- 2.d. Define the Command Design Pattern Work and explain with example. (CO4,K3) 2

2.e.	Elaborate when will we need Command Design Pattern. Explain it. (CO5,K4)	2
SECTION-B		30
3. Attempt all parts:-		
3.a. Answer any <u>one</u> of the following:-		
3.a.(i)	Explain how Design patterns categorized and also list out all the design patterns according to their category. (CO1,K3)	6
3.a.(ii)	List out the factors used to select the appropriate design pattern. (CO1,K3)	6
3.b. Answer any one of the following:-		
3.b.(i)	Describe the main purpose of the Abstract Factory pattern and give a simple example. (CO2,K3)	6
3.b.(ii)	Describe the Singleton pattern and its role in ensuring a single instance. (CO2,K3)	6
3.c. Answer any one of the following:-		
3.c.(i)	Mention the problems does the proxy pattern solve. (CO3,K3)	6
3.c.(ii)	What are the Advantages and Disadvantages of flyweight Design Pattern? (CO3,K2)	6
3.d. Answer any one of the following:-		
3.d.(i)	Elaborate the several aspects of the Command pattern may be varied or elaborated to help achieve particular design goals. (CO4,K4)	6
3.d.(ii)	Discuss what are advantages for Function Class. (CO4,K4)	6
3.e. Answer any one of the following:-		
3.e.(i)	Differentiate between behavioral and structural design pattern. (CO5, K2)	6
3.e.(ii)	Mention the benefits of the strategy and state design pattern. (CO5, K2)	6
SECTION-C		50
4. Answer any <u>one</u> of the following:-		
4-a.	Define Design Patterns and its types. Also discuss the requirements in selecting a Pattern. (CO1,K3)	10
4-b.	Explain the catalog of the design pattern in deatil. (CO1, K3)	10
5. Answer any <u>one</u> of the following:-		
5-a.	Discuss creational design patten. Explain how abstract factory design pattern used in Designing a website. (CO2,K3)	10
5-b.	Develop a smart home automation system using Builder pattern where users can select optional features for lighting, heating, and security. Include class diagram and construction sequence. (CO2, K4)	10
6. Answer any <u>one</u> of the following:-		
6-a.	Implement a cross-platform media player UI using Abstract Factory. Create buttons, sliders, and menus for Windows and Mac OS. Show class diagram and pseudocode. (CO3, K5)	10
6-b.	Demonstrate the use of Prototype pattern to clone multiple similar graphic objects (e.g., shapes, charts) in a drawing application. Include shallow and deep copy considerations. (CO3, K4)	10
7. Answer any <u>one</u> of the following:-		

- 7-a. Elaborate the problems that the Builder Pattern solve. (CO4, K3) 10
- 7-b. Briefly explain the difference between Adapter and facade pattern. (CO4, K2) 10
8. Answer any one of the following:-
- 8-a. Give difference between adapter and bridge design pattern using uml diagram. (CO5, K2) 10
- 8-b. Elaborate the Decorator Design Pattern (DDP) or Wrapper Pattern? Explain when to use the Decorator Structural Design Pattern.(CO5, K4) 10

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