

## **Design Pattern TT - 02**

**Time: 45 mins**

**Total Mark: 20**

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1. You are developing a video streaming application that needs to stream videos from remote servers. To improve performance and security, you need to implement caching and access control mechanisms for the remote video resources. How would you design the application to provide an intermediary object that acts between the client and the remote video objects, handling caching, access control, and other optimizations? (10)
2. How does the Decorator pattern allow you to add responsibilities to objects dynamically? (5)
3. Explain the Chain of Responsibility pattern with a real-world example and draw the UML diagram for the *Chain of Responsibility* design pattern. (1+4)

## **Design Pattern TT - 01**

**Time: 45 mins**

**Total Mark: 20**

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1. Describe the potential thread-safety issues that may arise when implementing the Singleton pattern in a multithreaded environment. Propose a solution with pseudo-code to address these issues. (3+4)
  2. What are the potential consequences of violating the Liskov Substitution Principle in a software system? How can such violations lead to unexpected behavior or errors? (4)
  3. In a video game development project, where the game includes various types of enemy characters with distinct behaviors and attributes. Which suitable design pattern should be applied to efficiently generate different enemy instances? Justify with pseudo-code. (7)
  4. What does “SOLID” mean in the design pattern?(2)

**TT#1; 2024; DBMS; Time: 25 minutes; Marks: 10**

Develop an Entity-Relationship (E-R) diagram based on the given scenario.

**Scenario:** Car Parking Management System

In a bustling urban area, there's a need for an efficient Car Parking Management System to streamline the process of parking and ensure optimal utilization of parking spaces. The system aims to provide a seamless experience for both the parking attendants and the users.

**Tips:**

- You have to identify the entities along with their attributes
- Establish the relationships between entities
- Represent this scenario in an E-R diagram

**DBMS TT#2; 2024; Marks: 20; Time: 30 minutes**

**Consider the following schema for an online retail store**

- Products (product\_id, name, description, price, category\_id)
- Categories (category\_id, name)
- Customers (customer\_id, name, email, address, phone\_number)
- Orders (order\_id, customer\_id, order\_date, total\_amount)
- Order\_Items (order\_item\_id, order\_id, product\_id, quantity, unit\_price)

**Now write the SQL for the following queries:**

1. Place an order for 5 pieces of shirt by the customer 'ABC'
2. Update the customer phone number who has the email 'abc@xyz.com'
3. Retrieve the total number of products in stock
4. Retrieve the total sales amount for each category
5. Retrieve customers who have not made any orders

Considering the following schema answer the queries: (Time: 30 minutes; marks: 20)

Tables:

1. Books:

- book\_id (Primary Key)
- title
- author
- genre
- publication\_year
- isbn

2. Members:

- member\_id (Primary Key)
- name
- email
- phone

3. Loans:

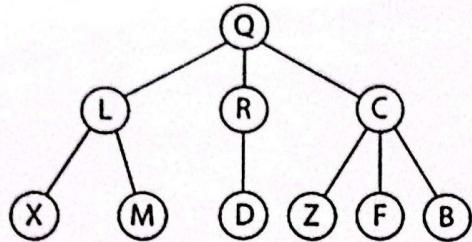
- loan\_id (Primary Key)
- book\_id (Foreign Key to Books table)
- member\_id (Foreign Key to Members table)
- loan\_date
- return\_date

Queries:

1. Retrieve all books
2. Retrieve all members
3. Retrieve all loans
4. Retrieve books by a specific author
5. Retrieve books published after a certain year
6. Retrieve all books currently on loan
7. Retrieve all members who have not returned their loans
8. Count the number of loans per member
9. List books and their number of times borrowed, ordered by borrow count
10. Retrieve books that are overdue (not returned after the due date)

100%  
100%  
100%

1. Answer all the following questions 02
  - a) What is admissible heuristics? 02
  - b) Compare BFS, DFS, UCS, DLS, and IDS. 02
2. For the tree below, list the order of the nodes expanded by: 06
  - Breadth-first search
  - Depth-first search
  - Each of the three stages of iterative-deepening depth-first search.



3. What is a heuristic? Design a heuristic function and solve the given 8-puzzle. 10

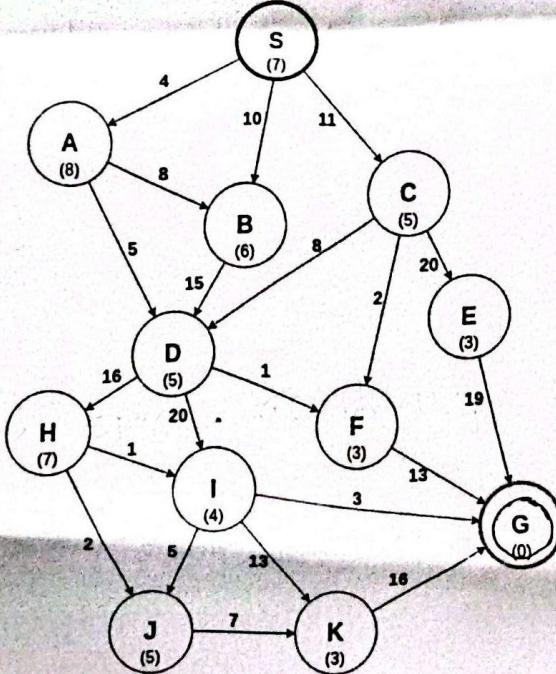
2	8	3
1	6	4
7		5

Initial State

1	2	3
8		4
7	6	5

Goal State

4. Consider the following graph: 10



The numbers on the edges represent the distance between the nodes and the numbers on the nodes represent the heuristic value. Find the most cost-effective path to reach from start state S to final state G using A\* algorithm. Show each step.

**Shahjalal University of Science and Technology  
Institute of Information and Communication Technology (IICT)  
Software Engineering  
3<sup>rd</sup> Year 1<sup>st</sup> Semester (Session: 2020-21)  
Course Title: Artificial Intelligence  
Term Test # 01   Date:05.03.24   Time:40 minutes**

- Answer all the following questions: 20 Marks
- |    |   |    |
|----|---|----|
| 1. | How do you design an intelligent agent? Write down the properties.  | 03 |
| 2. | What is your understanding of 'rational ignorance'? Provide an example.   | 03 |
| 3. | Describe the architecture of Utility-based agents.  | 04 |
| 4. | Write down the properties of the environment and describe them for Crossword, POKER, Taxi driving, Image analysis, and Medical diagnosis. | 10 |