



Assignment – 01

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Q1. Explain the role of Interfaces and Enums in software design with proper examples?

Ans: 1. Interfaces in Software Design:

An interface defines a **set of method declarations** that a class must implement. It focuses on **what operations are required**, not on how they are performed. Interfaces are widely used to achieve **abstraction, flexibility, and loose coupling** in software systems.

Role of Interfaces:

- Provide **standard behavior** across different classes
- Support **abstraction** by hiding implementation details
- Enable **loose coupling** between components
- Allow **multiple inheritance**
- Improve **maintainability and scalability**

Example of Interface:

```
interface Payment {  
    void pay(double amount);  
}  
class CreditCardPayment implements Payment {  
    public void pay(double amount) {  
        System.out.println("Paid " + amount + " using Credit Card");  
    }  
}  
class UpiPayment implements Payment {  
    public void pay(double amount) {  
        System.out.println("Paid " + amount + " using UPI");  
    }  
}
```

2. Enums in Software Design:

An **enum (enumeration)** is a special data type used to define a **fixed set of constant values**. Enums make the code **more readable, safer, and error-free**.

Role of Enums:

- Represent **fixed choices or states**
- Improve **type safety**
- Avoid use of hard-coded constants
- Make code **more readable and maintainable**
- Reduce logical errors

Example of Enum:

```
enum OrderStatus {  
  
    PLACED,  
  
    SHIPPED,  
  
    DELIVERED,  
  
    CANCELLED  
  
}
```

```
class Order {  
  
    OrderStatus status;  
  
}
```

Q2. Discuss how interfaces enable loose coupling with example?

Ans:

Loose coupling means that different components of a software system have **minimal dependency** on each other.

A loosely coupled system allows changes in one component **without affecting** other components.

Interfaces play a crucial role in achieving loose coupling by separating **what a class does** from **how it does it**.

Role of Interfaces in Loose Coupling:

Interfaces enable loose coupling in the following ways:

- Classes depend on interfaces, not concrete implementations
- Implementation details can be changed without modifying dependent classes
- Promotes flexibility, reusability, and scalability
- Makes the system easier to test and maintain

Example: Loose Coupling Using Interface

Step 1: Define an Interface:

```
interface MessageService {  
  
    void sendMessage(String message);  
  
}
```

Step 2: Implement the Interface:

```
class FileStorage implements Storage {  
    public void save(String data) {  
        System.out.println("Data saved to file: " + data);  
    }  
}
```

```
class CloudStorage implements Storage {  
    public void save(String data) {  
        System.out.println("Data saved to cloud: " + data);  
    }  
}
```

Step 3: Use Interface in Client Class

```
class DataManager {  
  
    Storage storage;  
  
    DataManager(Storage storage) {  
  
        this.storage = storage;  
  
    }  
  
    void storeData(String data) {  
  
        storage.save(data);  
  
    }  
  
}
```