



DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

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ASSIGNMENT

Student Name: Shubham Gupta

Branch: BE- CSE

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UID: 23BCS11045

Section/Group: 23BCS-KRG_2B

Subject Name: System Design

Que 1. Explain the role of interfaces and enums in software design with proper examples.

Ans.

INTERFACE: An interface defines a contract that a class must follow. It specifies what a class should do, but not how it should do it. Interfaces help achieve abstraction, loose coupling, and polymorphism.

IMPORTANCE OF INTERFACE:

- Promote flexibility: different classes can implement the same interface in different ways.
- Support multiple inheritance of behavior (a class can implement multiple interfaces).
- Make systems easier to extend and test.

EXAMPLE:

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



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ENUMS: An enum (enumeration) is a special data type that represents a fixed set of predefined constants. Enums improve type safety, readability, and maintainability.

IMPORTANCE OF INTERFACE:

- Prevent invalid values (only allowed constants can be used).
- Make code more self-documenting.
- Reduce errors caused by using strings or numbers for fixed values.

EXAMPLE:

```
enum OrderStatus {  
  
    PLACED,  
  
    SHIPPED,  
  
    DELIVERED,  
  
    CANCELLED  
  
}  
  
class Order {  
  
    OrderStatus status;  
  
}
```

Que 2. Discuss how interfaces enable loose coupling with example.

Ans.

When a class depends on an interface, it does not need to know:

- which concrete class is being used, or
- how the behavior is implemented?

This reduces dependency between components and makes the system easier to modify, extend, and test.



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EXAMPLE:

Step 1: Define an Interface

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

Step 2: Provide Implementations

```
class EmailService implements MessageService {  
    public void sendMessage(String message) {  
        System.out.println("Email sent: " + message);  
    }  
}  
  
class SMSService implements MessageService {  
    public void sendMessage(String message) {  
        System.out.println("SMS sent: " + message);  
    }  
}
```

Step 3: Use the Interface in a Client Class

```
class Notification {  
    private MessageService service;  
  
    Notification(MessageService service) {  
        this.service = service;  
    }  
  
    void notifyUser(String message) {  
        service.sendMessage(message);  
    }  
}
```

Usage

```
MessageService service = new EmailService();  
Notification notification = new Notification(service);  
notification.notifyUser("Hello!");
```

Que 3. Design a High-Level Design (HLD) for a Payment Processing System, showing where interfaces would be used.

Ans.

