



### **PART A (5 × 10 = 50 Marks)**

#### **Answer all the questions**

1. Anjali works at a technology firm where she's been assigned to lead a team to deliver an elaborate software program within a very tight schedule. At first, Anjali tries to coordinate with her associates and create her own model. But as the pressure mounts, her model crumbles and the entire team is rattled. Anjali spends a couple of days researching solutions and discovers the waterfall model. She goes through the waterfall model in detail and distributes the responsibilities for the project among several departments, based on the different phases of the model.
  - (i) When the Waterfall Model Used? (2 Marks)
  - (ii) At what situation, Waterfall Model is challenging one? (4 Marks)
  - (iii) How can the application of software engineering principles help the software development team? (4 Marks)
2. A software development team is tasked with building a new mobile app for a client. The team decides to follow an Agile process to deliver the app quickly and respond to changing requirements.
  - (i) Compare and contrast between any two software process models, and justify which model will be best applied to the software development team to build a new mobile app for a client in a quick time. (5 Marks)
  - (ii) List out the possible crisis Software Crisis faced by the developed team in building a new mobile app. (5 Marks)
3. Imagine you are working on a project to develop a new customer relationship management (CRM) system. Compare how you would approach the development using Booch, Jacobson, and Rumbaugh methodologies.
  - (i) What are the strengths and weaknesses of each methodology in this context? (5 Marks)

- (ii) Find the key artifacts and how would the final design development process differ? (5 M)
4. A banking system processes transactions and needs to ensure transaction is executed only if it passes through a series of validation (e.g., sufficient funds, account status, transaction limits).  
(i) Which design pattern allows setting up a sequence of pre-elements? (3 M)  
(ii) Provide a UML diagrammatic representation for proposed implementation for this scenario along with Use Case Diagram for the transaction process. (7 M)
5. At the start of each semester a student can request a prospectus containing a course list. Information about a course is provided, such as the tutor, department and prerequisites. The new system will allow students to create a schedule, then select four courses. Each student chooses two others in case their first choices become full or cancelled. No course can have more than 30 students.  
No course can have less than 10 students or it will be cancelled. The system will be the same functionality as available to other internal users of the system. When registration is complete, the registration system sends a message to the payment system to send out a payment bill to the student.  
Tutors use the system to find which course they are teaching as well as the students are. The registrar will administer the system.  
For a period at the beginning of the semester the student can change their schedule. Students must be allowed to access the system at this time to add or delete courses.  
(i) Analyze the 'Course Registration' requirements and represent them as a Use Case Diagram with preconditions, trigger, etc. (5 M)  
(ii) Draw a suitable interaction diagram to show how the various components communicate with each other? (5 M)

\*\*\*\*\*



# SASTRA

DEEMED TO BE UNIVERSITY

UNIVERSITY OF SOUTHERN INDIA

USAI - UGC Approved

THINK MERRIT | THINK TRANSPARENCY | THINK SASTRA



**School of Computing  
Second CIA Exam - SEP 2024**  
**Course Code: CSE 316**  
**Course Name: Software Design with UML**  
**Duration: 90 minutes Max. Marks: 50**

## **PART A**

**Answer any five of the following questions (5x10=50 Marks)**

1. A library management system needs to manage books, members, and staff. The system should allow:
  - Staff to add, remove, and update books.
  - Members to borrow and return books.
  - Tracking of books, including details like the author, ISBN, and availability.
  - Staff to issue and return books.Identify the list of classes, its relationships and explain the concepts of Generalization, Dependency, Composition, Aggregation and Association and illustrate this concepts for library management system. (10 Marks)
2. An online e-commerce application consists of the following modules such as **Product Management** - handling product details, categories, and inventory, **Order Management** - handling order placement, tracking, and returns, **User Management** - managing user profiles, authentication, and roles and **Payment Processing** - handling different payment gateways, invoices, and receipts.
  - (i) How would you represent the organization of these modules using a UML package diagram? (5 Marks)
  - (ii) List the importance of Package Diagram in this context with package notation? (5 Marks)
3. Consider the collaboration as defined below in a bank ATM. A customer wants to draw money from his bank account. He enters his card into an ATM (automated teller machine). The ATM machine prompts "Enter PIN". The customer enters his PIN. The ATM (internally) retrieves the bank account number from the card. The ATM encrypts the PIN and the account number and sends it over to the bank.

The bank verifies the encrypted Account and PIN number. If the PIN number is correct, the ATM displays “Enter amount”, draws money from the bank account and pays out the amount.

- (i) Create a collaboration diagram and incorporate all the steps and its relationships. (5 Marks)
  - (ii) Draw an activity diagram for an ATM and incorporating all the Scenarios in activity. (5 Marks)
4. Design an e-commerce platform that needs to support user registration, product browsing, shopping cart management and order processing. The system architecture includes several key components such as user interface, product catalog, shopping cart service, order processing service and payment gateway.
- (i) Develop a Component Diagram that represents the key components such as e-commerce system by including the elements such as Components, Interfaces and Relationships? (5 Marks)
  - (ii) Explain the purpose and usage of Component Diagram? (5 Marks)
5. Design the Deployment architecture for an online banking system. The system needs to handle user interactions and manage transactions. The components of the system include bank web server, application server, DB server and an external payment gateway.
- (i) Create a Deployment Diagram that represents the physical deployment of the Online Banking System by including the following elements such as nodes, artifacts and relationships. (5 Marks)
  - (ii) List the common types of Deployment Diagram and its purpose. (5 Marks)
6. Design a State Diagram for a Traffic Light Control System by including states, events (time lapsed, emergency vehicle, manual override) and transitions.. The System controls traffic lights for four directions namely North, South, East and West. Each Direction has a traffic light that can be in one of the several states: Red, Amber and Green. The System needs to handle transitions between these states to ensure the smooth traffic flow and safety. (10 Marks)

\*\*\*\*\*



**SASTRA**  
DEEMED TO BE UNIVERSITY

ESTD 1916

JGC Ad. 1916

THE SASTRA UNIVERSITY TRUST SASTRA



School of Computing

Third CIA Exam -NOV 2024

Course Code: CSE 316

Course Name: Software Design with UML

Duration: 90 minutes Max. Marks: 50

### PART A

**Answer any four of the following six Questions (4x10=40 Marks)**

1. Discuss the scenarios where the Waterfall Model would be an ideal choice for software development. Provide an example project where the Waterfall Model's structured approach is beneficial? Highlighting its key phases? (10 Marks)
2. You are developing a travel ticket booking system where customers, agent, etc., are stakeholders and classes need to be represented as objects.
  - (i) How do you map real-world entities to object-oriented classes? Identify the core elements and steps involved? (6 Marks)
  - (ii) Apply software design principles to ensure good design practices? (4 Marks)
3. You are tasked with analyzing system requirements for an online ticket booking system for a travel agency. During the analysis phase, you discover that stakeholders have differing opinions about essential features.
  - (i) What are the key elements, relationships and its boundary entity do you included for creating a use case diagram? (5 Marks)
  - (ii) Draw use case diagram for online ticket booking system. (5 Marks)
4. You are tasked with designing a class diagram for an online travel ticket booking system.
  - (i) What key elements must you include in your class diagram and how do you represent the different relationships and explore multiplicity among different classes? (5 Marks)

- (ii) How would you describe the package diagram model and what is its significance in the overall system architecture of a travel booking system? (5 Marks)
5. (i) As part of your component diagram for Online Travel Ticket Booking application, how do you incorporate the user interface components and what role do they play in the overall system architecture? (5 Marks)
- (ii) How would you represent the processors and their connections? What types of connections should you include for the Online Travel Ticket Booking application? (5 Marks)
6. Discuss the role of Interaction Diagrams in transitioning from the analysis phase to the design phase in software development. Explain how sequence diagram help in understanding object interactions and message flows. How do these diagrams contribute to the characterization stage, where system behaviors and interactions are defined? Illustrate your explanation for online ticket booking system. (10 Marks)

**Part - B : 1 x 10 = 10 Marks**  
**(Answer the following Question)**

7. (i) How does the Observer Design Pattern Work? Illustrate with UML class diagram showing Observer Pattern for online ticket booking system? (5 Marks)
- (ii) Compare and Contrast the Factory Method Pattern and Abstract Factory Pattern with UML Diagrams. (5 Marks)

\*\*\*\*\*

**SASTRA DEEMED UNIVERSITY**  
(A University under section 3 of the UGC Act, 1956)

**End Semester Examinations**

**Nov 2024**

**Course Code: CSE316**

**Course: SOFTWARE DESIGN WITH UML**

**QP No. :U052-5**

**Duration: 3 hours**

**Max. Marks:100**

**PART – A**

**Answer any Four questions**

**$4 \times 20 = 80$  Marks**

1. Apply the Waterfall model for the development of web-based Train ticket reservation system.
  - a) Analyze the possible problems faced and software crisis while implementing a software development project using Waterfall Model. (10)
  - b) How does the software engineering principle help in the software development process? (5)
  - c) Which design pattern would you use it for web-based Train ticket reservation system? (5)
2. You've been tasked with designing the class structure for the software required to manage a pizza restaurant. First you will be working on the core Pizza / Recipe / Oven / Chef sub system.
  - a) You decide to create a class Pizza, with methods such as Bake (), and a class Chef responsible with creating Pizza classes. Draw the UML diagram for the two classes, and explain which association you would use? (5)
  - b) Draw the UML diagram explaining how you would support the creation of multiple types of pizza, and name the design pattern you would use? (5)

- c) Which design pattern would you use to enable the recipe of the pizza, captured e.g. in a Recipe class, to be used in the creation of the Pizza class? Draw the class diagram for your design? (5)
- d) Use UML diagrams to explain how the Composite design patterns and the Flyweight design patterns works? (5)
3. To design a use case scenario for students registering and taking an NPTEL (National Programme on Technology Enhanced Learning) four weeks course and register for examination. The use case focuses on the registration process, assignment submission, exam scheduling, and certification upon completion. No course can have less than 250 students or it reserves right to be cancelled. This will be the same functionality as available to other internal users of the system. When registration is complete, the registration system sends a message to the payment system to send out a payment bill to the student. Tutors use the system to find which course they are teaching and who the students are. The NPTEL admin will administer the system. The tutor posts the assignments and students will submit assignments in the given time. Students must be allowed to access the system to register for more courses and a time. If the students failed to register for examinations, students will not get Hall Ticket to write the examination.
- a) Analyze the 'NPTEL Course Registration' requirements and represent them as a Use Case Diagram with preconditions, trigger, etc. (5)
- b) Write the importance of use case diagram and when and where the use case diagram is used? (5)
- c) Draw a suitable Collaboration diagram to show how the objects communicate with each other? (5)
- d) Write down the steps to draw Collaboration Diagram? (5)
4. Create a domain class diagram for an Online Shopping Mart.
- a) Identify potential classes and determine attributes for each class and draw the class diagram? (5)
- b) Write down the steps of how to model the collaborations and logical database schema using class diagram? (5)

- c) Illustrate the process of creating a Package Diagram? (5)
- d) How packages are defined, connected and organized. Discuss the benefits of using Package Diagrams? (5)
5. a) Create an activity diagram for the Hotel Reservation System and how would you depict this process in an activity diagram for the following scenario? (10)  
Scenario: You need to model a hotel room reservation process where:
- The user searches for available rooms.
  - The system checks availability.
  - If rooms are available, the user selects a room and proceeds to book.
  - If no rooms are available, the system offers an option to search again.
  - Once the booking is confirmed, the system sends a confirmation email.
- b) List out the components of Activity Diagram and when to use the Activity Diagram? (10)
6. Design an e-commerce platform that needs to support user registration, product browsing, shopping cart management, order processing and UPI payment. The system architecture includes several key components such as user interface, product catalog, shopping cart service, order processing service and payment gateway. such as e-commerce system by including the elements such as Components, Interfaces and relationships.  
a) Develop a Component Diagram that represents the key components and its Relationships? (5)  
b) Explain the purpose and when and where to use the Component Diagram? (5)  
c) Convert the component diagram into deployment diagram? (5)  
d) Identify the key element of deployment diagram? (5)

## **PART - B**

**Answer the following**

**1 x 20 = 20 Marks**

7. For the payroll system, some common requirements are as follows:
- It should allow employees to record time card information electronically
  - It should automatically generate paychecks based on the number of hours worked & total amount of sales for commission-based employees
  - It should have a web-based interface to allow employees to interact with the system
  - It should allow employee to operate ONLY on their own data records
  - It should allow employees to choose payment type
  - For payment, employees can be paid by the hour or salaried
  - The calculated salary of the hourly workers must be paid every two weeks on the Friday, where for salaried employees, it should be paid at the end of the month (last Friday of the month)
  - The system must be able to provide various types of reports for employees and managers.
    - a) Draw an overall class diagram. Clearly identify dependencies, associations (aggregation & composition) and multiplicities? (10)
    - b) Draw a sequence diagram and how the system is interacted? (5)
    - c) Draw the component diagram and convert into deployment diagram? (5)

\*\*\*\*\*