



MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust®, Mangalore)
Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi
Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

First Semester MCA Degree Examination, 2024-25

Object Oriented Modeling and Design

Time: 3 Hours

Max. Marks: 100

Note: 1. Answer any **FIVE** full questions, choosing **ONE** full question from each module.

2. **M: Marks, L: RBT (Revised Bloom's Taxonomy) level, C: Course outcomes.**

Module -1			M	L	C
Q1	a.	Model a Hospital Management System by identifying and defining key classes, their attributes, and methods. Create appropriate associations, generalizations, and dependencies between classes such as Doctors, Patients, Appointments, and Medical Records.	10	L3	CO1
	b.	A bank has different types of Accounts: Savings Account, Checking Account, and Fixed Deposit Account. All accounts share attributes like Account Number and Balance, but only a Savings Account earns interest, and a Fixed Deposit Account has a maturity date. How will you structure this system using generalization and also show how the interest calculation will be done.	10	L3	CO1
OR					
Q2	a.	Design a class diagram for a School Management System by identifying key classes, attributes, and methods. Establish appropriate relationships between Students, Teachers, Subjects, and Classes while ensuring that a student can enroll in multiple subjects and each subject can have multiple students. Additionally, use generalization to differentiate between Full-Time and Part-Time Teachers within the system.	10	L3	CO1
	b.	In a company, there are Full-Time Employees and Contract Employees. Both have common attributes like Employee ID, Name, and Department, but Full-Time Employees have Salaries, while Contract Employees have Hourly Rates. How would you model this using generalization in UML. Use an abstract class for the common attributes and methods.	10	L3	CO1
Module- 2					
Q3	a.	Draw a state diagram representing an 'Order' in an e-commerce system. Identify key states such as 'Pending,' 'Processed,' and 'Shipped,' and describe the events that trigger transitions between these states.	10	L3	CO2
	b.	Create a state diagram to represent the different stages of a train ticket booking system. Show the transitions between states and the events that trigger them.	10	L3	CO2
OR					
Q4	a.	Create a state diagram for a 'Payment Transaction' in an online payment system. Identify states such as 'Initiated,' 'Authorized,' 'Completed,' and 'Failed,'. Write down the different events leading to state transitions.	10	L3	CO2

	b.	Use a state diagram to illustrate the different phases of a movie ticket booking system. Show the transitions from 'Seat Selection' to 'Payment Processed' and finally 'Ticket Booked.'	10	L3	CO2
Module- 3					
Q5	a.	Design a use case diagram for an online banking system. Identify the different actors, use cases, and their interactions within the system.	10	L3	CO3
	b.	Create a sequence diagram for a library management system. Show how a user borrows a book, including interactions between the user, library system, and book database.	10	L3	CO3
OR					
Q6	a.	Design an activity diagram to represent the steps involved in booking a flight on an airline reservation system. Include key activities such as seat selection, payment verification, and ticket issuance.	10	L3	CO3
	b.	Create a sequence diagram for an online food ordering system. Identify the objects involved, such as customer, restaurant, and delivery service, and illustrate the message flow for order placement and delivery.	10	L3	CO3
Module- 4					
Q7	a.	A company has an Invoice class that calculates tax based on a fixed formula. Now, they want to support different tax policies (e.g., GST, VAT, Sales Tax) without modifying the existing class. How would you redesign the system to follow Open-Closed Principles(OCP), allowing new tax calculations to be added without modifying the Invoice class?	10	L3	CO4
	b.	Create a collaboration diagram to model the interactions between various objects involved in processing a customer's order, illustrating the sequence of messages exchanged to complete the process.	10	L3	CO4
OR					
Q8	a.	Create a collaboration diagram to visualize the interactions involved in processing a university course registration, showing communication between the student, course database, payment system, and admin portal.	10	L3	CO4
	b.	Make use of the given class diagram below and write the appropriate C++ code snippet for the same. <pre> classDiagram class Animal { +age: Int +gender: String +isMammal() +mate() } class Duck { +beakColor: String = "Yellow" +Swim() +quack() } class Fish { -size: Ft: Int -canEat: Boolean -Swim() } class Zebra { +is_wild: Boolean +run() } Animal < -- Duck Animal < -- Fish Animal < -- Zebra </pre>	10	L3	CO4
Module- 5					
Q9	a.	A payment processing system must support multiple payment methods (e.g., credit card, PayPal, cryptocurrency) that may change based on user choice or external conditions. Which design pattern would you apply to achieve this and why?	10	L3	CO5
	b.	In a social media platform, the system must notify users about real-time events such as friend requests, likes, and comments. Make use of Observer design pattern to solve the problem of dynamically managing these notifications without tightly coupling the notification system to user interface components.	10	L3	CO5
OR					

Q10	a.	An online navigation system must support multiple routing strategies (e.g., fastest route, scenic route, shortest distance) that may change based on user preferences or real-time traffic conditions. Which design pattern would you apply to enable this dynamic behavior and why?	10	L3	CO5
	b.	Consider a text editor that offers undo and redo capabilities for various actions like text insertion, deletion, and formatting. How does the Command design pattern address the challenge of encapsulating these actions, and what benefits does it provide in terms of maintainability and flexibility.	10	L3	CO5