

	a) Construct the Lock (L) and Unlock (U) timeline for both transactions following 2PL rules. (5 Marks) b) Identify if a deadlock occurs. If yes, demonstrate how it can be prevented using Wait-Die or Wound-Wait scheme							
Q9	For the given schedules, determine whether they satisfy the rules of 2PL, Strict 2PL, Rigorous 2PL, and Conservative 2PL protocols. <table> <tr> <td>(a) Lock S (A) R (A) Lock X (B) R (B) Unlock (A) W (B) Unlock (B)</td> <td>(b) Lock S (A) R (A) Lock X (B) Unlock (A) R (B) W (B) Commit Unlock (B)</td> <td>(c) Lock S (A) R (A) Lock X (B) R (B) W (B) Commit Unlock (A) Unlock (B)</td> <td>(d) Lock S (A) Lock X (B) R (B) W (B) R (A) Commit Unlock (A) Unlock (B)</td> <td>(e) Lock S (A) R (A) Unlock (A) Lock X (B) R (B) W (B) Unlock (B) Unlock (A) Commit</td> </tr> </table>	(a) Lock S (A) R (A) Lock X (B) R (B) Unlock (A) W (B) Unlock (B)	(b) Lock S (A) R (A) Lock X (B) Unlock (A) R (B) W (B) Commit Unlock (B)	(c) Lock S (A) R (A) Lock X (B) R (B) W (B) Commit Unlock (A) Unlock (B)	(d) Lock S (A) Lock X (B) R (B) W (B) R (A) Commit Unlock (A) Unlock (B)	(e) Lock S (A) R (A) Unlock (A) Lock X (B) R (B) W (B) Unlock (B) Unlock (A) Commit	2*5=10	CO4
(a) Lock S (A) R (A) Lock X (B) R (B) Unlock (A) W (B) Unlock (B)	(b) Lock S (A) R (A) Lock X (B) Unlock (A) R (B) W (B) Commit Unlock (B)	(c) Lock S (A) R (A) Lock X (B) R (B) W (B) Commit Unlock (A) Unlock (B)	(d) Lock S (A) Lock X (B) R (B) W (B) R (A) Commit Unlock (A) Unlock (B)	(e) Lock S (A) R (A) Unlock (A) Lock X (B) R (B) W (B) Unlock (B) Unlock (A) Commit				

SECTION-C
(2Qx20M=40 Marks)

Q 10	a. An E-commerce database contains a collection “order”. The order and item details are shown below. Write a MongoDB query to store each order with embedded items. Order Details <table><tr><th>Field</th><th>Value</th></tr><tr><td>id</td><td>101</td></tr><tr><td>customer</td><td>Rahul</td></tr><tr><td>status</td><td>delivered</td></tr><tr><td>totalAmount</td><td>5200</td></tr><tr><td>orderAt</td><td>2024-04-12</td></tr></table> Items Details <table><tr><th>Product</th><th>Quantity</th><th>Price</th></tr><tr><td>Bag</td><td>2</td><td>800</td></tr><tr><td>Mouse</td><td>1</td><td>600</td></tr></table>	Field	Value	id	101	customer	Rahul	status	delivered	totalAmount	5200	orderAt	2024-04-12	Product	Quantity	Price	Bag	2	800	Mouse	1	600		
Field	Value																							
id	101																							
customer	Rahul																							
status	delivered																							
totalAmount	5200																							
orderAt	2024-04-12																							
Product	Quantity	Price																						
Bag	2	800																						
Mouse	1	600																						
	b. Consider the above collection, write the following MongoDB queries: i. To find the total number of items purchased using the aggregate function. ii. To find orders where any item price ≥ 700 iii. To check if the order date is in 2024 iv. To find orders with totalAmount > 5000 AND status = Delivered v. To find orders where totalAmount ≥ 5000 AND at least one item price ≥ 800. vi. To find orders placed on 2024-04-12 OR with totalAmount < 3000	3+2+2+2+2 +2+2+5	CO4																					

	c. Demonstrate how to implement pagination in MongoDB with an example query.		
Q 11	a. Describe a recovery mechanism for a distributed database in case one site fails during transaction execution. b. Illustrate the Object Database Conceptual Design process with an example Or A university library system is implemented using a Distributed Object-Oriented Database (DOODB) across two campuses — North and South. The system includes the following classes and their example methods: - Book → showDetails(), checkAvailability() - Member → borrowBook(), returnBook() - Librarian → issueBook(), collectFine() a) Draw a class diagram showing the relationships among these classes. Apply suitable OOP principles such as inheritance, encapsulation, or abstraction wherever appropriate. (6 Marks) b) Explain briefly how data distribution and replication can be used in this distributed database system. c) If there are 5,000 Book objects, each of 20 KB, and they are replicated on both campuses, calculate the total storage required. d) Write two advantages and one limitation of using a Distributed Object-Oriented Database for this library system.	10+10 6+6+4+4	CO3