

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
B.Tech Degree S4 (R) (FT/WP) Examinations April 2026 (2024 Scheme)



Course Code: PCCST402

Course Name: DATABASE MANAGEMENT SYSTEMS

Max. Marks: 60

Duration: 2 hours 30 minutes

PART A

(Answer all questions. Each question carries 3 marks)

		CO	Marks
1	Explain the Database Management Systems approach and list its advantages over the file processing system.	1	(3)
2	Explain the concepts of super key, candidate key, and primary key with a suitable example.	1	(3)
3	Differentiate between DROP, DELETE, and TRUNCATE statements with examples.	4	(3)
4	Differentiate between entity integrity and referential integrity constraints with suitable examples.	2	(3)
5	Illustrate partial functional dependency with an example and demonstrate how it causes redundancy.	2	(3)
6	Illustrate the concept of a transaction with a suitable example.	3	(3)
7	Differentiate between relational databases and NOSQL databases.	5	(3)
8	How do flexible schema and horizontal scaling make NOSQL databases suitable for modern applications?	5	(3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

Module -1

- 9 a) Explain the concept of data models and discuss the main categories of data models. 1 (5)
- b) What are the different types of database languages? Explain DDL and DCL with examples. 1 (4)
- 10 A Library Management System has the following requirements: Members are identified by a unique MemberID and have attributes Name, Address, and Phone. Librarians are identified by a unique LibrarianID and have attributes Name and Email. Books are identified by a unique BookID and

include Title, Author, and Publisher. Each book may have multiple copies, and each copy is identified by a unique CopyID along with its Status.

Each member can borrow multiple book copies, but each copy can be issued to only one member at a time. Borrowing is recorded using an entity Issue (IssueID, IssueDate, DueDate, ReturnDate), which links members and book copies. A librarian handles multiple issue transactions, while each issue is processed by exactly one librarian.

Reservations are also maintained, where members can reserve books. Each reservation is identified by ReservationID and includes ReservationDate. A book can have multiple reservations, and a member can make multiple reservations.

Additionally, fines are recorded for late returns. Each fine is identified by FineID and includes Amount and PaymentStatus. Each fine is associated with a specific issue transaction.

Based on the above requirements, construct an ER diagram for the Library Management System. Clearly indicate all cardinality ratio constraints and participation constraints.

Module -2

- | | | | |
|----|---|---|-----|
| a) | Describe the unary operators of relational algebra and demonstrate them with suitable examples | 2 | (3) |
| | Consider the following relational database schema: | 4 | (6) |
| | Student (sid, sname, sgender, scity) | | |
| | Club (cid, cname, ccity) | | |
| | Event (eid, edate, etime, venue, category) | | |
| | Participation (sid, cid, eid, edate) | | |
| 11 | a) Write SQL statements to create the tables by appropriately specifying the primary keys, and insert suitable sample data for testing. | | |
| | b) Write an SQL query to find the names of students who have participated in at least one event. | | |
| | c) Write an SQL query to find the names of clubs located in the same city as the student with sid = 102. | | |
| | d) Write an SQL query to find the details of students associated with the club named 'TechForum'. | | |

- 12 Illustrate how the ALTER TABLE command is used in SQL to add, drop, 4 (4)
 a) and modify columns, and to drop a constraint, by presenting the clear
 syntax and suitable examples for each operation.
- b) Based on a suitable database scenario, justify the need for a trigger, create 4 (5)
 the trigger in SQL, and explain its syntax and execution.

Module -3

- 13 Explain 1NF, 2NF, and 3NF. Consider the relation ENROLL(StudentID, 2 (5)
 CourseID, StudentName, CourseName, Marks) with candidate key
 a) (StudentID, CourseID). Test whether the relation is in 2NF. If not,
 normalize it to 2NF, clearly showing the decomposition steps.
- b) Explain the concept of database recovery and describe the major recovery 3 (4)
 techniques, namely log-based recovery, checkpointing, and shadow paging,
 with suitable illustrations.
- a) Illustrate the major problems in transaction processing, namely lost update, 3 (4)
 dirty read, non-repeatable read, and inconsistent analysis, with suitable
 examples.
- 14 Describe the concept of conflict serializability. Examine the following 3 (5)
 b) schedule, identify all conflicting operation pairs, construct the precedence
 graph, and determine whether the schedule is conflict serializable.
 Schedule S: R1(X), R2(X), W1(X), W2(X), R2(Y), W2(Y), R1(Y), W1(Y)

Module -4

- 15 Examine the major types of NoSQL databases and identify the most 5 (5)
 a) suitable type for a recommendation system that must analyse relationships
 among users, movies, genres, and ratings, with justification.
- b) Describe the BASE properties of NoSQL databases and explain how they 5 (4)
 would benefit the design of a high-traffic social media platform where user-
 generated content is updated continuously.
- a) Explain the CAP theorem and determine which properties should be 5 (4)
 prioritized when designing a distributed stock trading platform.
- 16 Explain the important characteristics of key-value stores, the three 5 (5)
 b) operations on their APIs, and any one practical use case for them.
