



M.E / M.TECH/MCA DEGREE EXAMINATIONS: NOV/ DEC 2024

(Regulation 2024)

First Semester

MASTER OF COMPUTER APPLICATIONS

24CAI502: Database Management Systems

COURSE OUTCOMES

- CO1:** Understand fundamental database concepts and architecture, including relational and NoSQL systems, to support data management needs in various applications.
- CO2:** Apply relational database design principles, including normalization and SQL operations, to effectively structure and query databases.
- CO3:** Analyze different database technologies to select appropriate solutions for diverse organizational needs.
- CO4:** Implement concurrency control techniques and recovery mechanisms to achieve fault tolerance in database management systems.
- CO5:** Develop database systems using SQL and NoSQL technologies, ensuring efficient data storage, retrieval, and transaction management across various platforms.

Time: Three Hours

Maximum Marks: 100

PART A (4*20 = 80 Marks)

1. a) Draw the block diagram for the architecture of the database management system and explain. 5 CO1 [K₁]
- b) List the various operations of the SQL and explain. 4 CO1 [K₂]
- Consider the following relational schema:
 Student (Regno, Sname, Address, S_mobile, S_email, UGbranchcode)
 Education(Regno,10marks,12marks,UGmarks)
 Parents(Regno, Fathername, Occupation, annual_income, fathermobile, f_email, Mothername, Occupation, Annual_income, Mothermobile, M_email)
 Branch(Regno, UGBranchcode, Branchname)
- c) Write the following queries using SQL queries. 8 CO1 [K₄]
1. Find the names of the students have their parents annual income greater than 8 lakhs.

2. Find the students having 10th, 12th and UG percentage not less than 70%.
 3. Find the students belonging to other than computer science as their UG degree.
 4. List the names of the students belonging to computer science and computer applications as their UG degree.
- d) How will you create a table for an online shopping portal to store data of customers like their names, country, age, phone, email id and recent purchase amount? 3 CO1 [K₆]

2. a) Consider the following table 10 CO2 [K₃]

| employee_id | name | job_code | job | state_code | home_state |
|-------------|-------|----------|-----------|------------|------------|
| E001 | Alice | J01 | Chef | 26 | Michigan |
| E001 | Alice | J02 | Waiter | 26 | Michigan |
| E002 | Bob | J02 | Waiter | 56 | Wyoming |
| E002 | Bob | J03 | Bartender | 56 | Wyoming |
| E003 | Alice | J01 | Chef | 56 | Wyoming |

Explain how the above table normalized into Third Normal form.

- b) Consider the following student registration schema 10 CO2 [K₄]

Student file

1. Student Number
2. Student Name
3. Address
4. Mobile Number

Course File

1. Course Number
2. Description
3. Hours
4. Professor Number

Professor file

1. Professor Number
2. Name
3. Office

Registration file

1. Student Number
2. Course Number
3. Date

Consider the suitable tuple for the table. Analyse and write the DML statements for the following

1. Find the course that a specific professor teaches.
 2. Find the professor who teaches a specific course.
 3. For a specific student number, in which courses is the student registered and what is his/her name.
 4. Find the professors for a specific student.
 5. Find the student registered for a specific course.
3. a) Explain the database structure to handle the text and image files a mobile application. 4 CO3 [K₂]
 - b) Differentiate the features of MongoDB and DynamoDB. suggest the best databases for mobile application development. 8 CO3 [K₄]
 - c) How the smart city project interacts with humans, technology and organization by using blockchain technology? Explain. 8 CO4 [K₃]
 4. a) Create a collection for a customer DB with Customer ID, Customer Name, Mobile Number, Purchase amount, Purchase Date, Purchase Points and cumulative purchase points using MongoDB. Write a query to get customer name, mobile number and cumulative purchase points. 8 CO5 [K₄]
 - b) The customer contains data related to billing addresses while the order aggregate consists of ordered items, shipping addresses, and payments. The payment also contains the billing address. Design an aggregate data model for customer and order. 7 CO5 [K₄]
 - c) Explain the features, advantages and disadvantages of Key-Value Databases. 5 CO5 [K₂]

Answer any ONE Question
PART B (1*20 = 20 Marks)

5. a) A car rental company maintains a database for all the type of vehicles. The database includes vehicle identification number, licence number, manufacturer name, model, date of purchase, and colour. Apart from the regular vehicle data store, some special data are to be included for certain types of vehicles. They are
 1. Trucks : cargo capacity

2. Sports cars: horse power, renter age requirements

3. Vans: number of passengers

Assess and Construct an ER Model for the car rental company database

b) Explain the working principle of two phase locking protocol in concurrency. 5 CO3 [K₂]

OR

6. a) Classify the database failures and explain how these failures are addressed by shadow paging recovery. 6 CO3 [K₂]

b) What is meant by distribution model in No SQL? Explain the techniques to distribute the data in No SQL databases. 6 CO5 [K₂]

c) Write a program in PL/SQL to update the salary of a specific employee by 8% of Basic pay if the basic pay is less than Rs. 15,000 and update of a specific employee by 6% if the basic pay is between Rs. 15,000 to Rs. 30,000 and 4% for those employees having basic pay greater than Rs. 30,000 and display the employee_id, employee name and revised salary. 8 CO3 [K₄]
