Course Code & Name	26CAPC2003 Introduction to RDBMS & SQL		
Teaching Hours /week (L: T:P: R)	3:1:0:0	Credits	4
CIE Marks	40	ESE Marks	60
Course Type	Theory (PCC)	Exam Hours	3
Prerequisites (if any)	-		

Course Objectives:

1. To provide a clear understanding of fundamental principles of Database Management Systems (DBMS) with special focus on Relational Databases.
2. To gain knowledge on the concepts of Entity Relationship (ER) model, Relational Database principles, Structured Query Language (SQL), and Normalization.

Course Outcomes (COs)

At the end of the course students should be able to:

CO#	Course Outcomes	Bloom's Knowledge Level (KL)
CO 1	Apply the concepts of Database Management Systems and data modeling techniques using ER and Extended ER concepts for effective database design.	2
CO 2	Conceptualize data using the relational model and develop normalized schema according to design principles.	3
CO 3	Develop queries for relational database in the context of practical applications	3
CO 4	Solve database problems using PLSQL.	3

Note: *K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

CO #	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	3	2	2	2	1	-	1	2
CO 2	3	3	2	2	1	-	1	2
CO 3	3	3	2	3	2	1	2	2
CO 4	3	3	2	3	2	1	2	3

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), - : No Correlation*

Course Assessment Method

(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE)

Attendance	Assignment/ Micro-project	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
8	12	10	10	40 Marks

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions.

PART A	PART B	TOTAL
■ 2 Questions from each module. ■ Total of 8 Questions, each carrying 3 marks **(8x3 =24 marks)**	■ Each question carries 9 marks. ■ Two questions will be given from each module, out of which 1 question should be answered. ■ Each question can have a maximum of 3 subdivisions. **(4x9 = 36 marks)**	**60 Marks**

SYLLABUS

Module #	Syllabus Description	Hours
1	**Database Management System Concepts:** Data, Database, Database management system, File system Vs DBMS, Applications of DBMS, Data Abstraction, Data Independence, Database Schema, Overall structure of DBMS. Two tier and Three tier architecture of database. Data Models- Data Modeling and Data Models, Entity Relationship (ER) Modeling – The entity Relationship Model, Developing an ER Diagram. Extended ER Features: Specialization, Generalization, Aggregation.	14
2	**Introduction to the Relational Database Model:** Structure of relational database, Degree and Cardinality, Database Schema,	12

	Schema Diagrams, Keys, Integrity constraints, Indexes, Codds Relational Database Rules. Relationships within the Relational Database, Difference between DBMS and RDBMS. **Normalization:** Functional Dependency, Types of Functional Dependency, The need for Normalization, First Normalization, Second Normal Form Relation, Third Normal Form.	
3	**Introduction to SQL:** Introduction to SQL, Data Definition Commands, Data Manipulation Commands, Transaction Control Commands, Data Control Commands, Null Values, SELECT Queries. Advanced SELECT with Group by, Having Clause, Aggregate Functions, Numeric functions, String functions, Date functions, Nested queries and Join operations.	**12**
4	**Advanced SQL:** Introduction to PLSQL, Programs with loop concepts, Use of record type variables, Functions, Procedures, Cursors and Triggers.	**10**

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition & Year**
1	Database System Concepts	Henry Korth A. Silberschatz	McGraw-Hill	Sixth Edition, 2011
2	Database Principles: Fundamentals of Design, Implementation and Management	Peter Rob and Carlos Coronel	Thomson Press (India) Ltd	9th Edition 2012

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition & Year**
1	Fundamentals of Database Systems	Ramez Elmasri & Shamkant B. Navathe	Pearson Education	7th Edition 2016
2	Database Management Concepts	Ashutosh Kumar Dubay	S.K. Kataria & Sons	1st Edition 2012

3	Database Management Systems	Raghu Ramakrishnan, Johannes Gehrke	McGraw Hill	3rd Edition 2014

Web References/ Video Links (NPTEL, SWAYAM…)	
Sl.No	**Link ID**
1	https://nptel.ac.in/courses/106/106/106106220
2	https://www.udacity.com/course/databasesystems-concepts-design--ud150

Course Level Assessment Questions

Course Outcome 1 (CO1):

- Define *Database Management System (DBMS)* and list any three functions of a DBMS.
- Explain how a DBMS differs from a traditional file system in terms of data processing and management.
- Given a simple scenario of a college database (with students, courses, and faculty), construct a basic *Entity Relationship (ER) diagram* to represent the relationships among these entities.
- Analyze the different *degrees of data abstraction* in a DBMS architecture and describe how they help achieve data independence.
- Design an extended ER model incorporating *specialization*, *generalization*, and *aggregation* for a hospital management system.

Course Outcome 2 (CO2):

1. Define the following terms: *Degree*, *Cardinality*, and *Database Schema*.
2. Explain *Codd's Relational Database Rules* and discuss how they form the foundation of the Relational Database Model.
3. Given a relational table for *Employee(Emp_ID, Emp_Name, Dept_ID, Dept_Name, Salary)*, identify the *primary key*, *foreign key*, and *candidate key*, and draw the corresponding *schema diagram.*
4. Evaluate the role of *integrity constraints* and *indexes* in maintaining data accuracy and improving query performance in relational databases.

5. Design a database for a *university course registration system* and normalize it step by step up to *Boyce–Codd Normal Form (BCNF)*. Clearly show the functional dependencies and normalization process.

Course Outcome 3 (CO3):

1. List the different categories of SQL commands and give one example for each (Data Definition, Data Manipulation, Transaction Control, and Data Control).
2. Explain the difference between the *WHERE* and *HAVING* clauses in SQL with suitable examples.
3. Write SQL queries to perform the following operations on a table EMPLOYEE (Emp_ID, Emp_Name, Department, Salary, DOJ):
   a)Display all employees who joined after 2020.
   b) Increase the salary of employees in the "HR" department by 10%.
4. Analyze how *aggregate functions* and *GROUP BY* can be used together to summarize employee data department-wise. Provide an example query.
5. Evaluate the importance of *Transaction Control Commands* (COMMIT, ROLLBACK, and SAVEPOINT) in maintaining data integrity during multi-step transactions.
6. Design a set of SQL queries using *JOIN operations* and *nested subqueries* to generate a consolidated report showing each department's average salary and list of employees earning above that average.

Course Outcome 4 (CO4):

1. aDefine *PL/SQL*. List the major components of a PL/SQL block and describe their purpose.
2. Explain the difference between *procedures* and *functions* in PL/SQL with suitable examples.
3. Write a PL/SQL program using a *loop* to display the first 10 even numbers.
4. Analyze how *cursors* help in row-by-row processing of query results in PL/SQL. Provide an example to illustrate the use of *explicit cursors*.
5. Evaluate the advantages of using *triggers* in database applications. Discuss situations where using triggers might not be recommended.
6. Design a PL/SQL program for a *student database* that includes:
   - A record type variable to store student details.

- A procedure to insert records.
- A trigger that automatically logs an entry whenever a new student is added.

Model Question Paper

Reg No.:_____ Name:_____

FEDERAL INSTITUTE OF SCIENCE AND TECHNOLOGY

MCA Integrated S2 (R) Examination ----------(2026 Scheme)

Course Code: 26CAPC2003

Course Name: Introduction to RDBMS & SQL

Max. Marks: 60 Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

		CO	Marks
1	Differentiate logical data independence and physical data independence.	CO1	(3)
2	Define Entity. Explain weak entity with example.	CO1	(3)
3	Which are different categories of keys used in relational model?	CO2	(3)
4	Define functional dependency and list the axioms of it?	CO2	(3)
5	Distinguish between HAVING and WHERE clause in SQL with example?	CO3	(3)
6	What is Theta join operation? Define natural join operation giving an example.	CO3	(3)
7	Define PL/SQL. List the major components of a PL/SQL block and describe their purpse.	CO4	(3)
8	What is the advantage of having exceptions? How it can be implemented.	CO4	(3)

PART B

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

Module I

9	a) Write briefly on any four advantages of database approach over conventional file based approach.	CO1	(6)
	b) Explain the system structure of DBMS?		(3)

OR

10	a) Construct an Entity-Relationship Diagram for a database of research projects. The database should contain the information about the following **Projects** : name, manager, budget, duration (in years), funding agency **Employees** : SSN, name, projects, salary Each project is funded by a single agency. Project names are unique within an agency. An employee can be associated with several projects. Managers are employees. You can make other additional assumptions that make sense in the real world.	CO1	(6)
	b) With the help of an example, explain generalization and specialization in Extended ER features.		(3)
	Module II		
11	a) Explain the relational model concept and discuss the different relational model constraints.	CO2	(6)
	b) Differentiate between instance and schema of a database. Give an example in the context of relational DB.		(3)
	OR		
12	a) What is Normalisation? Explain the characteristics of first, second and third normal forms.		(4)
	b) Consider a relation R(A,B,C,D,E,F,G) with A and CD as candidate keys. Assume that the following dependencies hold on R: D→FG, F→G, C→A. Split R into the third normal form quoting the reason for each step.	CO2	(5)
	Module III		
13	a) Consider the following relation(s). ***department*** (Dept_ID, Dept_Name, Dept_Head, Dept_Location) ***employee*** (Emp_ID, Emp_FName, Emp_Salary, Emp_DOB, Emp_Gender, Dept_ID) Answer the following query using SQL. (i) Find the name of employees whose name contains a letter 'E' and belongs to the department ID's 10, 20 and 30. (ii) Find the name of employees whose salary is in the range of 25000-50000. Also, all those employees were born in the year 2010. (iii) Find the total and average salaries of the department's 10, 20 & 30 Sort the query result in default order.	CO3	(6)
	b) Compare inner join and outer join operations		(3)
	OR		
14	a) Explain the different components of SQL language with the help of examples?	CO3	(6)
	b) List out any three aggregation functions with suitable examples		(3)
	Module IV		

15	a)	Explain the difference between *procedures* and *functions* in PL/SQL with suitable examples.	CO4	(5)
	b)	Write a PL/SQL program to display the first ten odd numbers using the concept of loop.		(4)

OR

16	a)	Analyze how *cursors* help in row-by-row processing of query results in PL/SQL. Provide an example to illustrate the use of *explicit cursors*.	CO4	(6)
	b)	What is a trigger? Evaluate the advantages of using *triggers* in database applications.		(3)

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