Database Management Systems

Course Code: **MCA- 107**
Course Name: **Database Management Systems**

INSTRUCTIONS TO PAPER SETTERS:
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 12 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:
In this course, the learners will be able to develop expertise related to the following:-
1. Develop a broad understanding of database concepts and database management system software, data models, schemas and instances, data constraints, relational algebra and calculus.
2. Acquire Knowledge to model an application's data requirements using conceptual modeling tools like ER diagrams and design database schemas based on the conceptual model.
3. Be able to write SQL and PL/SQL commands to create and manipulate database objects.
4. Be able to discuss importance of normalization and improve the database design by applying various normal forms.
5. Get in depth knowledge of concurrency control mechanisms, transaction management techniques and database security.

PRE-REQUISITES:
1. Elementary Maths (Sets, Relations)
2. Computer fundamentals related to memory organization such as primary memory, secondary memory etc.
3. Knowledge of basic data structures.
4. Basic knowledge of data storage and file management system.

COURSE OUTCOMES (COs):
After completion of this course, the learners will be able to:-

CO #	Detailed Statement of the CO	BT Level	Mapping to PO #
CO1	Explain the various database components, models, DBMS architecture and Database Security	BTL2	PO1, PO2, PO3

CO2	Apply relational database theory to construct relational algebra expression, tuple and domain relation expression for SQL queries.	BTL3	PO1, PO2, PO3, PO4, PO5
CO3	Construct advanced SQL queries on data and apply Procedural abilities through PL/SQL.	BTL4	PO1, PO2, PO3, PO4, PO5
CO4	Examine the use of normalization and functional dependency for database design.	BTL4	PO1, PO2, PO3, PO4, PO6, PO11, PO12
CO5	Appraise the concepts of transaction, concurrency control and recovery in databases.	BTL5	PO1, PO2, PO3, PO4, PO6, PO8,PO10, PO11, PO12

UNIT – I

No. of Hours: 10 **Chapter / Book Reference: TB1 [Chapters 1-4]; TB2 [Chapters 1-2]**

Basic concepts: Database & database users, characteristics of the database, database systems, concepts and architecture, Data Models, Schemas & Instances, DBMS architecture & data independence, Overview of hierarchical, Network & Relational Data Base Management Systems.

Data Modelling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, Concepts of keys, Extended ER model – Generalization, Specialization, Aggregation, ER diagram to tables Mapping.

UNIT – II

No. of Hours: 10 **Chapter / Book Reference: TB1 [Chapters 5, 6, 8, 9]; TB2 [Chapters 3-5]; TB3 [Chapters 7-11]**

Relational Model: Relational data model, **Relational integrity constraints:** Entity Integrity, Referential integrity, Domain Constraints, Key constraints. **Relational Algebra, Relational calculus:** Tuple Relational Calculus and domain Relational calculus.

Introduction on SQL: SQL commands and types: DML, DDL, DCL, TCL. SQL Datatypes and literals, Operators in SQL. **Database Objects**: Table, View, Sequence, Index, Synonym, Queries. **Advanced SQL:** Functions: Single Row Functions, Aggregate functions, Sub queries, Join Operations. **Set Operations**: Unions, Intersection, Minus.

UNIT – III

No. of Hours: 10 **Chapter / Book Reference: TB1 [Chapters 10, 11]; TB2 [Chapters 7, 9]; TB3 [Chapters 15, 16, 18]**

Normalization: Functional dependencies, Normal forms- 1NF, 2NF, 3NF, BCNF, join dependencies and multi-valued dependencies.

PL/SQL Programming: Introduction to PL/SQL, Structure of PL/SQL Block, PL/SQL language: Operators, Control Structure, Cursors, Triggers, Procedures and functions.

UNIT – IV

No. of Hours: 10 **Chapter / Book Reference: TB1 [Chapters 17-20, 23]; TB2 [Chapters 6, 15-17]**

Transaction processing concept: Transaction system, Testing of serializability, serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log-based recovery, checkpoints, deadlock handling.
Concurrency control techniques: Concurrency control, locking techniques, time stamp ordering, granularity of data items, recovery from catastrophic failures.
Concepts of object-oriented database management systems, Distributed Data Base Management Systems, overview of Database Security Concepts.

TEXT BOOKS:

TB1. Elmsari and Navathe, "Fundamentals of Database Systems", Pearson Education, 7th Edition, 2016.
TB2. Korth, Silberschatz, "Fundamentals of Database System Concepts", TMH, 6th Edition, 2010.
TB3. Ivan Bayross, "SQL, PL/SQL the Programming language of Oracle", BPB Publications, 2010.

REFERENCE BOOKS:

RB1. Ullman J. D., "Principals of Database Systems", Galgotia Publications, 2nd Edition, 1999.
RB2. C.J.Date, A. Kannan, S. Swamynathan "An Introduction to Database Systems", Pearson Education, 8th Edition, 2006.
RB3. Desai B., "An Introduction to Database Concepts", Galgotia Publications, New Delhi.
RB4. Shio Kumar Singh, "Databases Systems Concepts, Design and Applications", Pearson Publication, 2nd Edition, 2011.
RB5. Rajiv Chopra, "Database Management System (DBMS) - A Practical Approach", S. Chand & Company Pvt. Ltd., 4th Edition, 2014.