set 1

K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Nov – Dec 2025
B. Tech Program: Computer Engineering Scheme: III
Regular Examination: SY Semester: III
Course Code: CEC303 and Course Name: Database Management System
Date of Exam: 29/11/2025 Duration: 02.5 Hours Max. Marks: 60

Instructions:
(1)All questions are compulsory.
(2)Draw neat diagrams wherever applicable.
(3)Assume suitable data, if necessary.

Q. No.	Question	Max. Marks	CO	BT level
Q 1	Solve any **two** questions out of three: (05 marks each)	10		
a)	Explain the advantages of database system over file system.		CO1	U
b)	Explain different types of two phase locking protocols.		CO6	U
c)	Consider the following database schema: **EMPLOYEE**(EmpID, EmpName, Designation, Salary, DeptID, ManagerID) **DEPARTMENT**(DeptID, DeptName, Location) **PROJECT**(ProjID, ProjName, DeptID, Budget) Write **SQL queries** for the following tasks: 1. Find all employees working in the 'Research' department. 2. Retrieve the names of employees who earn more than their managers. 3. List employee names along with their corresponding department names and project names.		CO4	Ap
Q 2	Solve any **two** questions out of three: (05 marks each)	10		
a)	Define and explain the concepts of cardinality and participation constraints in a relationship set. Provide an example illustrating both.		CO2	U
b)	Define a transaction and explain its ACID properties with examples.		CO6	U
c)	Describe the process of normalization of the given relation 'Book' up to Third Normal Form (3NF). **BOOK(BookID**, Title, AuthorID, AuthorName, PublisherID, PublisherName) The following **Functional Dependencies (FDs)** hold: 1. BookID → Title, AuthorID, PublisherID		CO5	Ap

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	2. AuthorID → AuthorName 3. PublisherID → PublisherName			
Q.3	Solve any **two** questions out of three. (10 marks each)	20		
a)	Consider the following database schema: **CUSTOMER(CustID**, CustName, City) **ACCOUNT(AccNo**, CustID, Balance, BranchID) **BRANCH(BranchID**, BranchName, City) **Write relational algebra expressions for the following queries:** i. Find all customers who have an account in the 'Andheri' branch. ii. Retrieve customer names whose account balance exceeds ₹50,000. iii. List customer names along with their corresponding branch names. iv. Find customers who have accounts in branches located in the same city they live in. v. Retrieve names of branches where no customer has an account.		CO3	Ap
b)	Draw an **EER Diagram** that clearly shows all entities, attributes, relationships (with cardinalities and participation), and the **specialization/generalization hierarchies** for a **University Management and Research System**. The university consists of several **departments**, each uniquely identified by a **DeptID**, with attributes such as **DeptName**, **Location**, and **ContactNo**. Every department offers multiple **courses**, identified by a **CourseID**, with attributes **CourseName**, **Credits**, and **SemesterOffered**. Each course is handled by one or more **faculty members**, and each faculty can teach multiple courses. Faculty members are identified by **FacultyID** and described by **FacultyName**, **Designation**, **Qualification**, **Salary**, and **Experience**. Each **student** is associated with one department and can enroll in several courses. Students are identified by **StudentID** and have attributes **StudentName**, **Email**, **Program**, **YearOfAdmission**, and **CGPA**. Every student is guided by one faculty advisor. The system must also maintain **project and research data**; each department may undertake multiple **research projects**, identified by unique **ProjectID**, **ProjectTitle**, **FundingAgency**, **Budget**, **StartDate**, and **EndDate**. A project can involve multiple faculty members and students. A **Faculty** can be either a **Permanent Faculty** or a **Visiting Faculty**. Permanent faculty members have attributes like **JoiningDate** and **Grade**, while visiting faculty members have **ContractDuration** and **HourlyPay**. Students can be **Undergraduate** and **Postgraduate** students. Undergraduate students have		CO2	Ap

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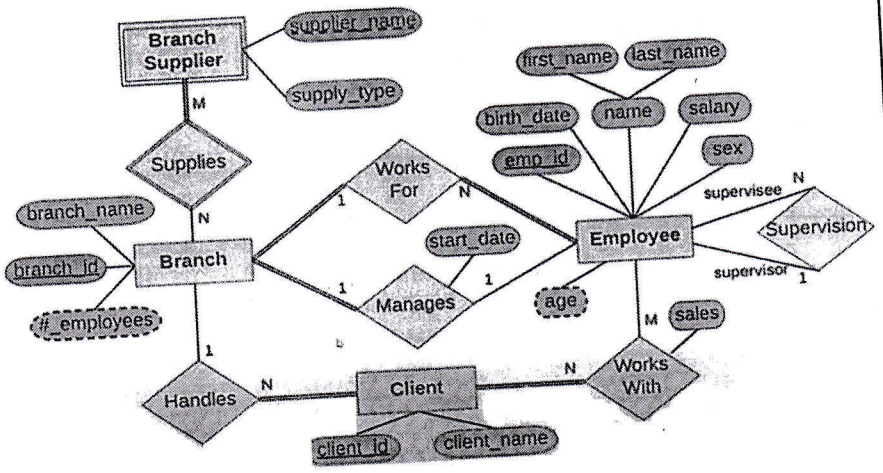
	InternshipStatus and **MinorSpecialization**, while postgraduate students have **ThesisTitle** and **GuideID**.			
c)	Explain Superkey, Candidate Key, Primary Key, Alternate Key, Foreign Key. Also for the given relation **R(A, B, C, D, E, F, G)** and the following set of **functional dependencies**, find all the **candidate keys** using the **attribute closure** method. **Functional Dependencies:** i. $A \rightarrow B, C$ ii. $C, D \rightarrow E$ iii. $E \rightarrow F$ iv. $B, D \rightarrow G$ v. $G \rightarrow A$		CO5	Ap
Q.4	Solve any **two** questions out of three. (10 marks each)	20		
a)	Convert the given ER diagram into its equivalent relational schema diagram using all 7 steps of Codd's rule		CO3	Ap
b)	i.) Explain view and it types with syntax and example (06M) ii.) Create a view that displays all employees earning above the average salary of their department. (02M) Relations:		CO4	Ap



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Employee(EID, Name, Salary, DeptID)
Department(DeptID, DeptName)

iii.) Create a view showing all orders placed by customers from "Mumbai" in the year 2024. (02M)
Relations:
Customer(CustID, Name, City)
Orders(OrderID, CustID, OrderDate, Amount)

c) i) Explain concurrent execution of transactions and discuss conflict serializability, also check if the schedule S1 is conflict serializable or not? — CO6 — Ap

S1: R1(A), W2(B),R2(C), R2(B),W1(B),W3(A),R3(B), W1(C)

T1	T2	T3
R(A)		
	W(B)	
	R(C)	
	R(B)	
W(B)		
		W(A)
		R(B)
W(C)		

ii) Describe how concurrency control is achieved using timestamp-based protocols.

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