CBCS SCHEME

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21CS53

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Database Management Systems

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain with neat diagram, the component modules of DBMS. **(10 Marks)**

b. What are the responsibilities of DBA and Database designer? **(04 Marks)**

c. Define the following with example :
(i) Weak entity and Strong entity
(ii) Simple and Composite attribute
(iii) Database and DBMS **(06 Marks)**

OR

2 a. With neat diagram explain three schema architecture? What is the difference between logical data independence and physical data independence? **(08 Marks)**

b. Design an ER diagram for an company database with atleast four entities. **(08 Marks)**

c. What is the degree of relationship? Explain with example. **(04 Marks)**

Module-2

3 a. Give the ER to relationship mapping algorithm. Discuss each step with example. **(10 Marks)**

b. With example explain different set operations in relational algebra. **(06 Marks)**

c. Explain Entity Integrity and Referential Integrity. **(04 Marks)**

OR

4 a. Consider the following relational database schema:
EMPLOYEE (Ssn, Ename, Bdate, Address, Sex, Salary, Super_Ssn, Dno)
DEPARTMENT (Dname, Dnumber, Mgr_Ssn, Mgr_start_date)
PROJECT (Pnumber, Pname, Plocation, Dnum)
WORKS_ON (Essn, Pno, Hrs)
DEPENDENT (Essn, Dep_name, Sex, Bdate, relationship)

Express the following queries in relational algebra:
i) Retrieve the name and salary of all employees who work in department number 5.
ii) Retrieve the name of employees who work on all the projects that 'Rama' works on.
iii) Retrieve each department number, the number of employees in the department and their average salary.
iv) Retrieve the names of employees who have no dependent.
v) Retrieve the names and address of all employees who work for the 'CS' department. **(10 Marks)**

b. Explain characteristics of a relation. **(05 Marks)**

c. What are Update operations? Explain. **(05 Marks)**

Module-3

5 a. Explain how to specify the constraints in SQL during the table creation with example. **(06 Marks)**

b. Write a note on embedded SQL. How would you connect a database? Illustrate with example. **(08 Marks)**

c. Explain INSERT, DELETE, UPDATE statements in SQL with example. **(06 Marks)**

OR

6 a. Consider the relational database schema in Q.No.4(a) [REFER]

Express the following queries in SQL:

i) Retrieve the name and address of all employees who work for the 'CS' department.

ii) For every project located in 'Vijayanagara', list the project number, the controlling department – number, and the department manager's name, address and birth date.

iii) Retrieve the names of all employees who do not have supervisors.

iv) Find the sum of the salaries of all employees, the maximum salary, the minimum salary and the average salary.

v) Foe each project, retrieve the project number, the project name and the number of employees who work on that project. **(10 Marks)**

b. What is stored procedure? When it is useful? Write general form of declaring stored procedure. **(06 Marks)**

c. Write a note on dynamic SQL. **(04 Marks)**

Module-4

7 a. Explain the informal design guidelines for relational schema. **(08 Marks)**

b. What is FD? Write an algorithm to find the minimal cover for a set of functional dependencies. **(06 Marks)**

c. Given a set of FD's for a relation R(A,B,C,D,E)

(i) $A \rightarrow B$, $AB \rightarrow C$, $D \rightarrow AC$, $D \rightarrow E$

(ii) $A \rightarrow BC$, $D \rightarrow AE$.

Is they are equivalent? **(06 Marks)**

OR

8 a. Define NF. Explain 1NF, 2NF, 3NF with example. **(08 Marks)**

b. What is lossless join property of decomposition? Why it is important? **(06 Marks)**

c. What is Multi Value Dependency (MVD)? Explain 4NF and 5NF with example. **(06 Marks)**

Module-5

9 a. Explain the problems that may encountered when two simple transactions run concurrently. **(08 Marks)**

b. Explain transition diagram for transaction execution. **(06 Marks)**

c. Explain ACID properties of a database transaction. **(06 Marks)**

OR

10 a. Explain the concept of Binary Lock and Shared Lock. **(08 Marks)**

b. What is Deadlock? Explain deadlock prevention protocol. **(06 Marks)**

c. Explain multiple granurality locking protocol. **(06 Marks)**

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