Total number of printed pages: 03 **UG/4th /UCSE404**

2025

Database Management Systems

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. a) What is the difference between 2-tier and 3-tier client/server architectures? 5

b)

A	B	C	TUPLE#
10	b1	c1	1
10	b2	c2	2
11	b4	c1	3
12	b3	c4	4
13	b1	c1	5
14	b3	c4	6

Consider the above mentioned instance of relation r:

Given the previous extension (state), which of the following dependencies may hold in the above relation instance? If the dependency cannot hold, explain why by specifying the tuples that cause the violation. 10

i. A→B
ii. B→C
iii. C→B
iv. B→A
v. C→A

c) Does the above relation have a potential candidate key? If it does, what is it? If it does not, why not? 5

2. a) Design a database for an airline. The database must keep track of customers and their reservations, flights and their status, seat assignments on individual flights, and schedule and routing of future flights. 15
Your design should include an ER diagram, a set of a relational schemas, and list of primary keys and foreign keys.

b) Explain about specialization and generalization in Extended E-R model. 5

3. a) Explain following **Relational Algebra** operations with example: 10

Selection, Projection, Union, Intersection, Set difference.

b) Differentiate between DML and DDL statement in SQL. Explain about Outer Join. 10

4. 20

emp (**eno,** ename, bdate, title, salary, dno)
proj (**pno**, pname, budget, dno)
dept (**dno**, dname, mgr_eno)
workson (**eno, pno**, resp, hours)

Consider the above mentioned database where primary keys are underlined. Write the following queries in SQL.

i. Write an SQL query that returns the project number and name for projects with a budget greater than $100,000.
ii. Write an SQL query that returns all works on records where hours worked is less than 10 and the responsibility is 'Manager'.
iii. Write an SQL query that returns the employees (number and name only) who have a title of 'EE' or 'SA' and make more than $35,000.
iv. Write an SQL query that returns the employees (name only) in department 'D1' ordered by decreasing salary.
v. Write an SQL query that returns the departments (all fields) ordered by ascending department name.
vi. Write an SQL query that returns the employee name, department name, and employee title.
vii. Write an SQL query that returns the project name, hours worked, and project number for all works on records where hours > 10.
viii. Write an SQL query that returns the project name, department name, and budget for all projects with a budget < $50,000.
ix. Write an SQL query that returns the employee numbers and salaries of all employees in the 'Consulting' department ordered by descending salary.
x. Write an SQL query that returns the employee name, project name, employee title, and hours for all works on records.

5. a) Consider the following set F of functional dependencies on the relation schema r(A, B, C, D, E, F), 8

$F=\{A \rightarrow BCD, BC \rightarrow DE, B \rightarrow D, D \rightarrow A\}$

Give a BCNF decomposition of r using the original set of functional dependencies.

b) What is canonical cover? What is attribute closure? 4

c) Write short notes on RDBMS Constraints. 8

6 a) Explain ACID properties of a Transaction. 8

b) Draw a state diagram and discuss the typical states that a transaction goes through during execution. 8

c) Give the example of cascadless and recoverable schedule. 4

7. a) Discuss the problems of deadlock and starvation, and the different approaches to dealing with these problems. 8

b) What do you mean by strict two phase and rigorous two phase locking protocol? 6

c) Explain Wait-die and wound-wait deadlock prevention scheme 6

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