



QUESTION PAPER

Name of the Examination: Fall 2023-24 Semester – CAT-2

Course Code: CSE2018

Course Title: Database Management Systems

Set number: 1

Date of Exam: 18/10/2023 (Fri) (DI)

Duration: 90 Minutes

Total Marks: 50

Instructions:

1. Assume data wherever necessary. Any assumptions made should be clearly stated.
2. Answer all questions

Q1. (a) The following Relational Schema R (A, B, C, D) have the following functional dependencies: $F = \{A \rightarrow BC, B \rightarrow AC, DC \rightarrow B\}$. Find all super keys and also identify all candidate keys.

(b) Consider Relational Schema R (A, D, H, C, E) and it is stated by two sets of functional dependencies F1 and F2.

$F1 = \{A \rightarrow C, AC \rightarrow D, E \rightarrow AD, E \rightarrow H\}$

$F2 = \{A \rightarrow CD, E \rightarrow H\}$

Check, F1 and F2 are equivalent or not? Justify.

[8+7]

Q2. (a) Explain BCNF and its decomposition strategy with a suitable example.

(b) Check which highest normal form will be satisfied by the given relation along with the provided functional dependencies: R (A, B, C, D, E, F, G, H, I, J) and $F = \{AB \rightarrow C, AD \rightarrow GH, BD \rightarrow EF, A \rightarrow I, H \rightarrow J\}$. Also, decompose the table into its next higher normal form.

[7+8]

Q3. Consider the following schema:

branch(branch_name, branch_city, assets)

customer(customer_name, customer_street, customer_city)

loan(loan_number, branch_name, amount)

borrower(customer_name, loan_number)

account(account_number, branch_name, balance)

depositor(customer_name, account_number)

Write the following queries in SQL:

- (a) Find all customers of the bank who have an account but not a loan
- (b) Find the names of all customers who live on the same street and in the same city as "Venkat"
- (c) Find the name of all branches with customers who have an account in the bank and who live in "Vijayawada"
- (d) Find out the total sum of all loan amounts in the bank.
- (e) Find the names of all branches that have assets greater than those of at least one branch located in "Vijayawada".

[10]

Q4. Describe the following transformation rules used by query optimizer:

- (a) Commutativity of Natural Join and Cross Product
- (b) Commuting Select with Natural Join or Cross Product
- (c) Commuting Project with Natural Join or Cross Product
- (d) Commuting Select with Set operations
- (e) Converting a Select and Cross Product into Natural Join

[10]

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	3	1,2,3,4			15
Q2	3	3	1,2,3,4			15
Q3	4	4	1,2,3,5			10
Q4	4	4	1,2,3,5			10



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QUESTION PAPER

Name of the Examination: Fall 2023-24 Semester – CAT-2

Course Code: CSE2018

Course Title: Database Management Systems

Set number: 4

Date of Exam: 19/10/2023 (AN)

Duration: 90 mins

Total Marks: 50

(E2)

Instructions:

1. Assume data wherever necessary.
2. Any assumptions made should be clearly stated.

Q1. (a) Consider a relation $R(A, B, C, D, E)$ with the following dependencies:

$AB \rightarrow C, CD \rightarrow E, DE \rightarrow B$

Is AB a candidate key of this relation? If not, is ABD ? Explain your answer. **(5M)**

(b) Consider a relation scheme $R = (A, B, C, D, E, H)$ on which the following functional dependencies hold:

$\{A \rightarrow B, BC \rightarrow D, E \rightarrow C, D \rightarrow A\}$

Write the candidate keys of R ? **(5M)**

Q2. Given a relation $R(A, B, C, D)$ and Functional Dependency set $FD = \{AB \rightarrow CD, B \rightarrow C\}$, determine whether the given R is in 2NF? If not convert it into 2NF **(15M)**

Q3. Write an SQL query for student database:

- (i) Create a table with following fields.

Reg.no (number(Primary Key))

Name (text)

M1 (number)

M2 (number)

- (ii) Add the column college to the existing table
- (iii) Delete the column M2 from the table
- (iv) Display name of the students whose M1 marks is >75
- (v) Drop the student table.

(10M)

Q4. Translate the following query into a relational algebra expression,

- SELECT name, age FROM Employee WHERE department = 'Sales';
- SELECT name FROM Employee WHERE department = 'Sales' UNION SELECT name FROM Employee WHERE department = 'Marketing';
- SELECT name FROM Employee WHERE department = 'HR' INTERSECT SELECT name FROM Employee WHERE department = 'Finance';
- SELECT name FROM Employee WHERE department = 'IT' EXCEPT SELECT name FROM Employee WHERE department = 'Development';
- SELECT department, COUNT(*) AS employee_count FROM Employee GROUP BY department HAVING COUNT(*) > 3;

(3M+3M+3M+3M+3M)

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	3	1,3	1	1	10
Q2	3	3	1,3	1	1	15
Q3	4	4	1,3	1,3	1	10
Q4	4	4	1,3	1,3	1	15

QUESTION PAPER

Name of the Examination: Fall 2023-24 Semester – CAT-2

Course Code: CSE2018

Course Title: Database Management Systems

Set number: 5

Date of Exam: 17/10/2023 (Fri) (C1)

Duration: 90 mins

Total Marks: 50

Instructions:

1. Assume data wherever necessary.
2. Any assumptions made should be clearly stated.

Q1. Consider the following relation:

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

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

i. $A \rightarrow B$, ii. $B \rightarrow C$, iii. $C \rightarrow B$, iv. $B \rightarrow A$, v. $C \rightarrow A$ **(5M)**

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

Q2. Given a relation R(P, Q, R, S, T) and Functional Dependency set $FD = \{ PQ \rightarrow R, S \rightarrow T \}$, determine whether the given R is in 2NF? If not convert it into 2 NF. **(15M)**

Q3. Consider the following tables:

- Employee (Emp_no, Name, Emp_city)
- Company (Com_id, Company_name, Salary, Emp_no)
- Works_on (Project_id, Project_name, Hours, Com_id, Emp_no)

- (a) Write a SQL query to display Employee name and company name.
- (b) Write a SQL query to display employee name, employee city, company name and salary of all the employees whose salary > 10000
- (c) Write a query to display all the employees details working in "XYZ" company

- (d) Write a query to display all the employees details and project details working in "ABC" project

(2M+2M+3M+3M)

Q4. Translate the following query into a relational algebra expression,

- SELECT first_name, last_name FROM employees WHERE department = 'HR'.
- SELECT product_name, price FROM products WHERE price > 50 ORDER BY product_name
- SELECT customer_name, COUNT(order_id) FROM orders GROUP BY customer_name HAVING COUNT(order_id) > 2
- SELECT employees.first_name, departments.department_name FROM employees INNER JOIN departments ON employees.department_id = departments.department_id
- SELECT employee_id, hire_date FROM employees WHERE hire_date BETWEEN '2022-01-01' AND '2022-12-31'.

(3M+3M+3M+3M+3M)

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	3	1,3	1	1	10
Q2	3	3	1,3	1	1	15
Q3	4	4	1,3	1,3	1	10
Q4	4	4	1,3	1,3	1	15