Subject Name Solutions

1333204 – Summer 2024

Semester 1 Study Material

Detailed Solutions and Explanations

Question 1(a) [3 marks]

Define: DBMS, Instance, Metadata

Solution

- **DBMS (Database Management System)**: Software that enables users to create, maintain, and access databases by controlling data organization, storage, retrieval, security, and integrity.
- **Instance**: The actual data stored in a database at a particular moment in time. It's the current state or snapshot of a database.
- **Metadata**: Data about data that describes database structure, including tables, fields, relationships, constraints, and indexes.

Mnemonic

"DIM view" - Database system, Instance snapshot, Metadata description

Question 1(b) [4 marks]

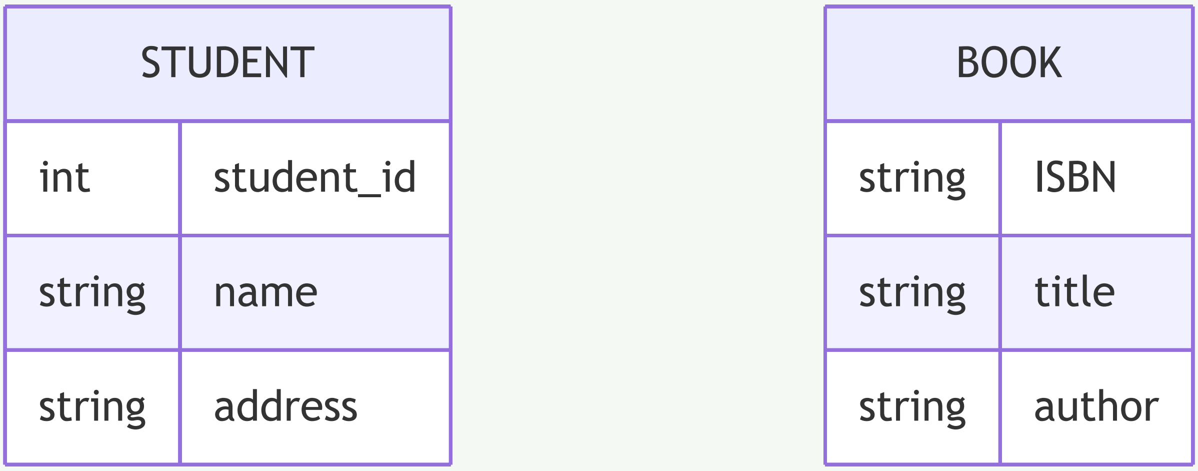
Define and Explain with example: 1.Entity 2. Attribute

Solution

Table 1: Entity vs Attribute

Concept	Definition	Example
Entity	A real-world object or concept that can be distinctly identified	Student (John), Book (Harry Potter), Car (Toyota Camry)
Attribute	Characteristic or property that describes an entity	Student: roll_no, name, addressBook: ISBN, title, author

Diagram:



STUDENT	
int	student_id
string	name
string	address

BOOK	
string	ISBN
string	title
string	author

Mnemonic

"EA-PC" - Entities Are Physical/Conceptual, Attributes Provide Characteristics

Question 1(c) [7 marks]

Write the full form of DBA. Explain the roles and responsibilities of DBA.

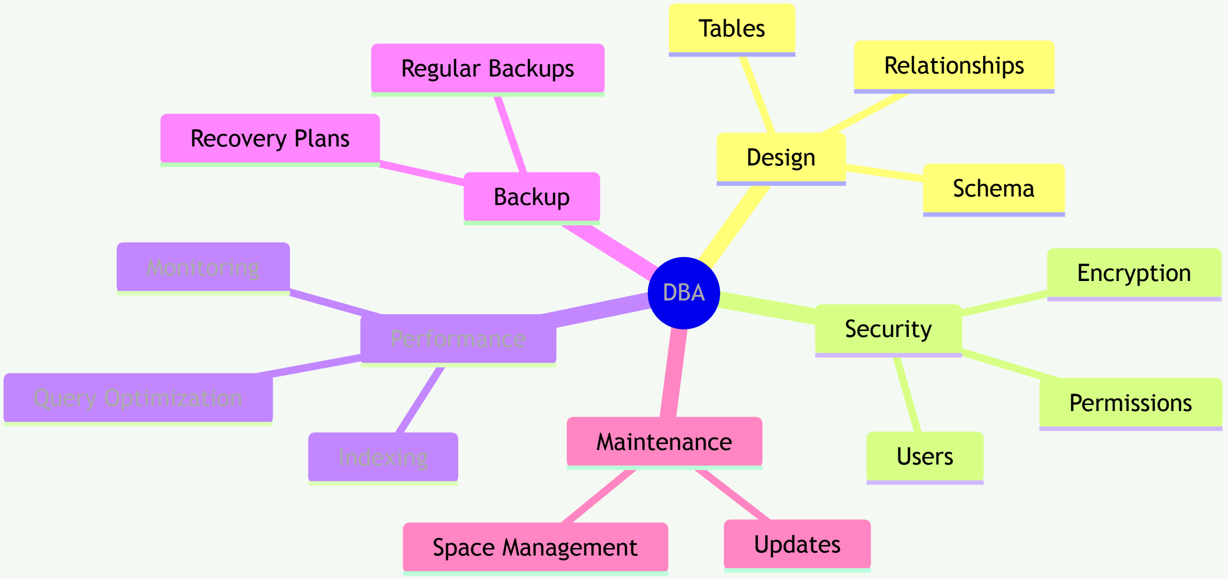
Solution

DBA stands for **Database Administrator**.

Table 2: DBA Responsibilities

Role	Description
Database Design	Creates logical/physical database structure and schema
Security Management	Controls access through user accounts and permissions
Performance Tuning	Optimizes queries, indexes for faster data retrieval
Backup & Recovery	Implements strategies to prevent data loss
Maintenance	Updates software, applies patches, monitors space

Diagram:



Mnemonic

"SPMBU" - Security, Performance, Maintenance, Backup, Updates

Question 1(c) OR [7 marks]

Explain relational and network data models in detail.

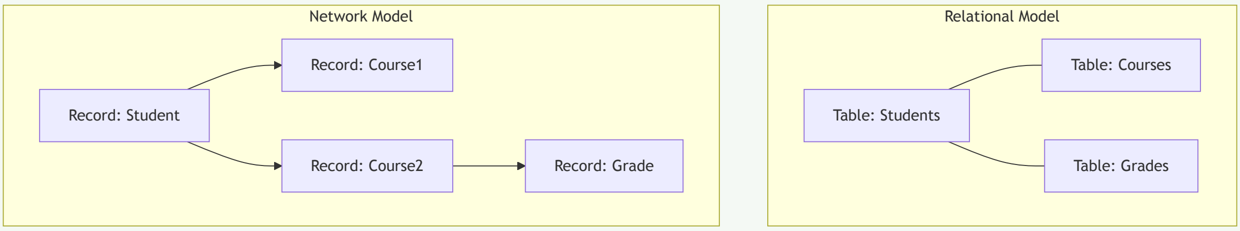
Solution

Table 3: Relational vs Network Data Models

Feature	Relational Model	Network Model
Structure	Tables (relations) with rows and columns	Records connected by pointers forming complex networks
Relationship	Related through primary & foreign keys	Direct links between parent-child records
Flexibility	High - tables can be joined as needed	Limited - predefined physical connections

Examples	MySQL, Oracle, SQL Server	IDS, IDMS
Query Language	SQL (structured query language)	Procedural languages

Diagram:



Mnemonic

"RSPEN" - Relational uses Sets, Pointers Enable Networks

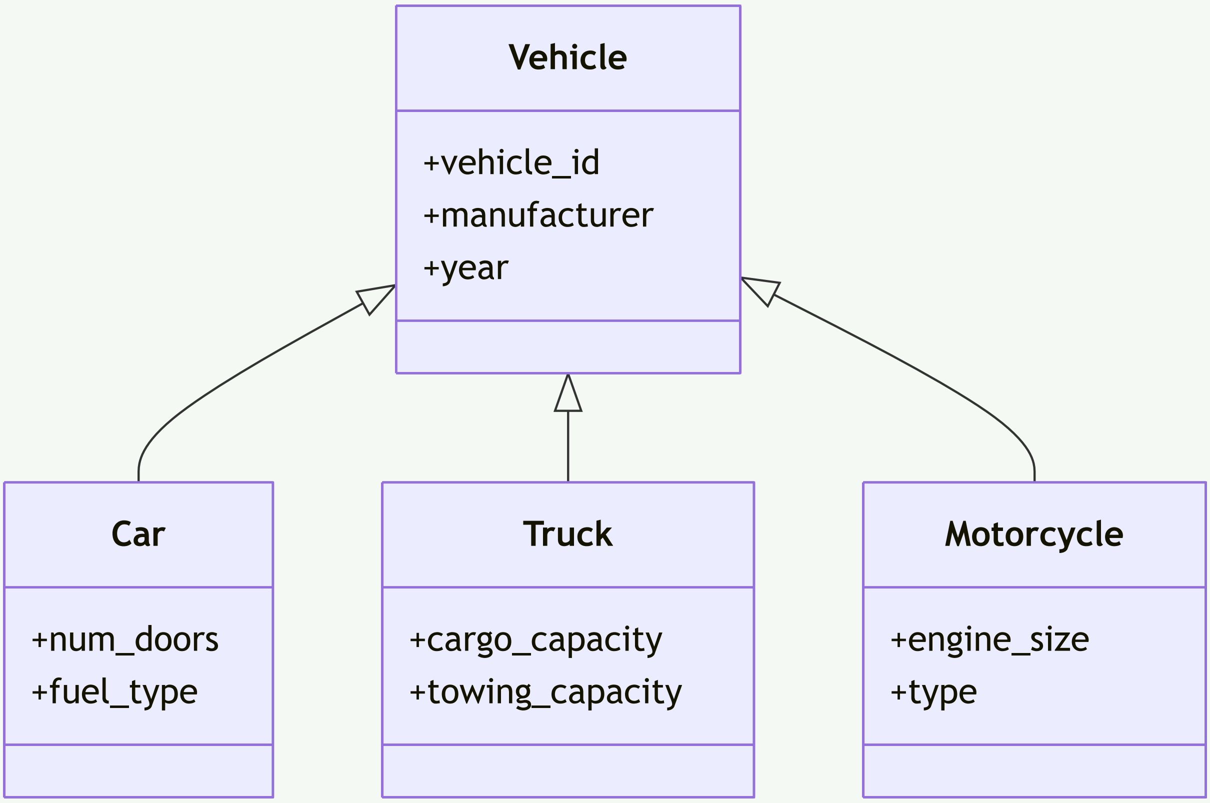
Question 2(a) [3 marks]

Draw figure and Explain Generalization.

Solution

Generalization: The process of extracting common characteristics from two or more entities to create a new higher-level entity.

Diagram:



Mnemonic

"BUSH" - Bottom-Up Shared Hierarchy

Question 2(b) [4 marks]

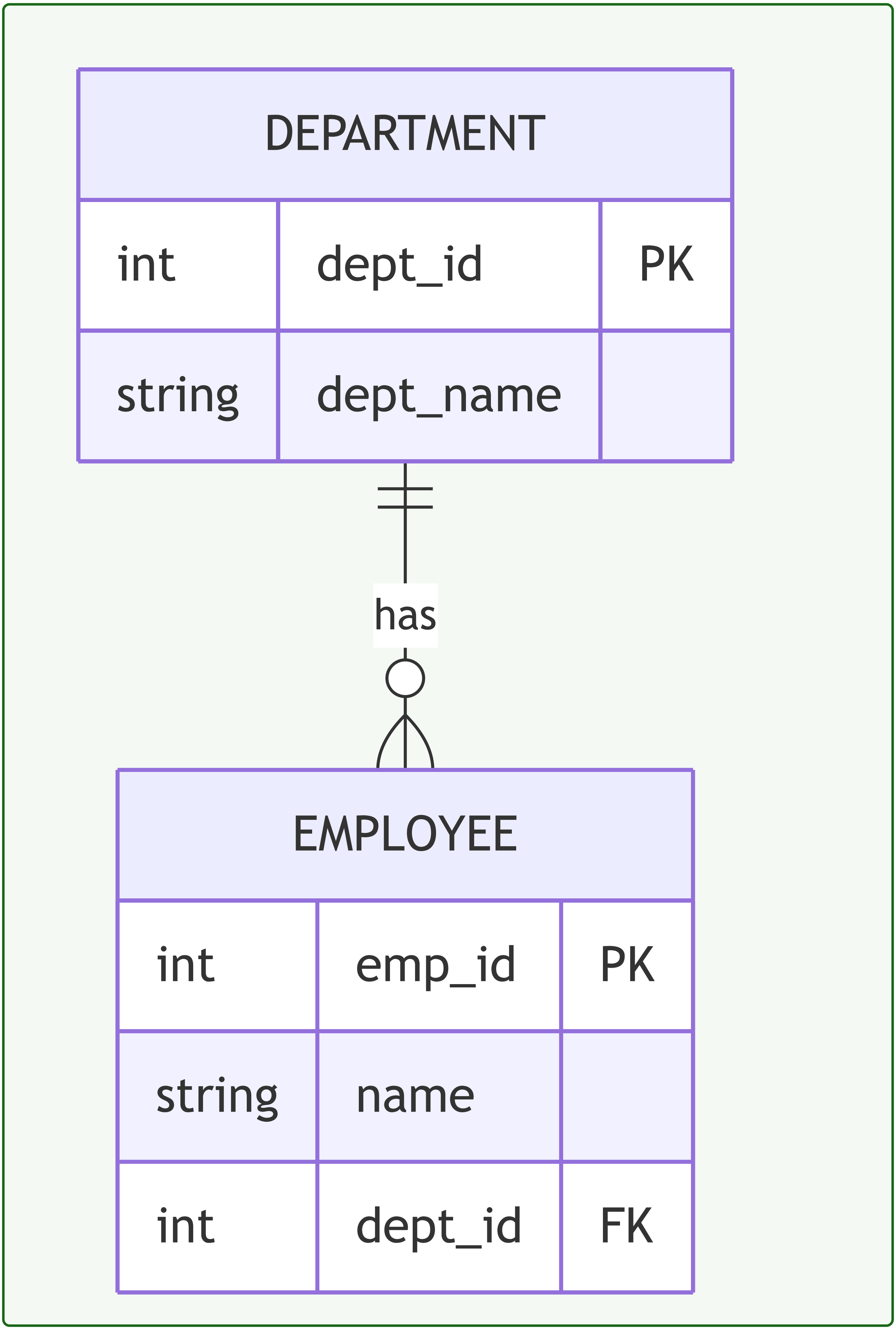
Explain Primary Key and Foreign Key Constraints.

Solution

Table 4: Primary Key vs Foreign Key

Constraint	Definition	Properties	Example
Primary Key	Uniquely identifies each record in a table	Unique, Not Null, Only one per table	StudentID in Students table
Foreign Key	Links data between tables, references a primary key in another table	Can be NULL, Multiple allowed per table	DeptID in Employees table referencing Departments table

Diagram:



DEPARTMENT		
int	dept_id	PK
string	dept_name	

EMPLOYEE		
int	emp_id	PK
string	name	
int	dept_id	FK

Mnemonic

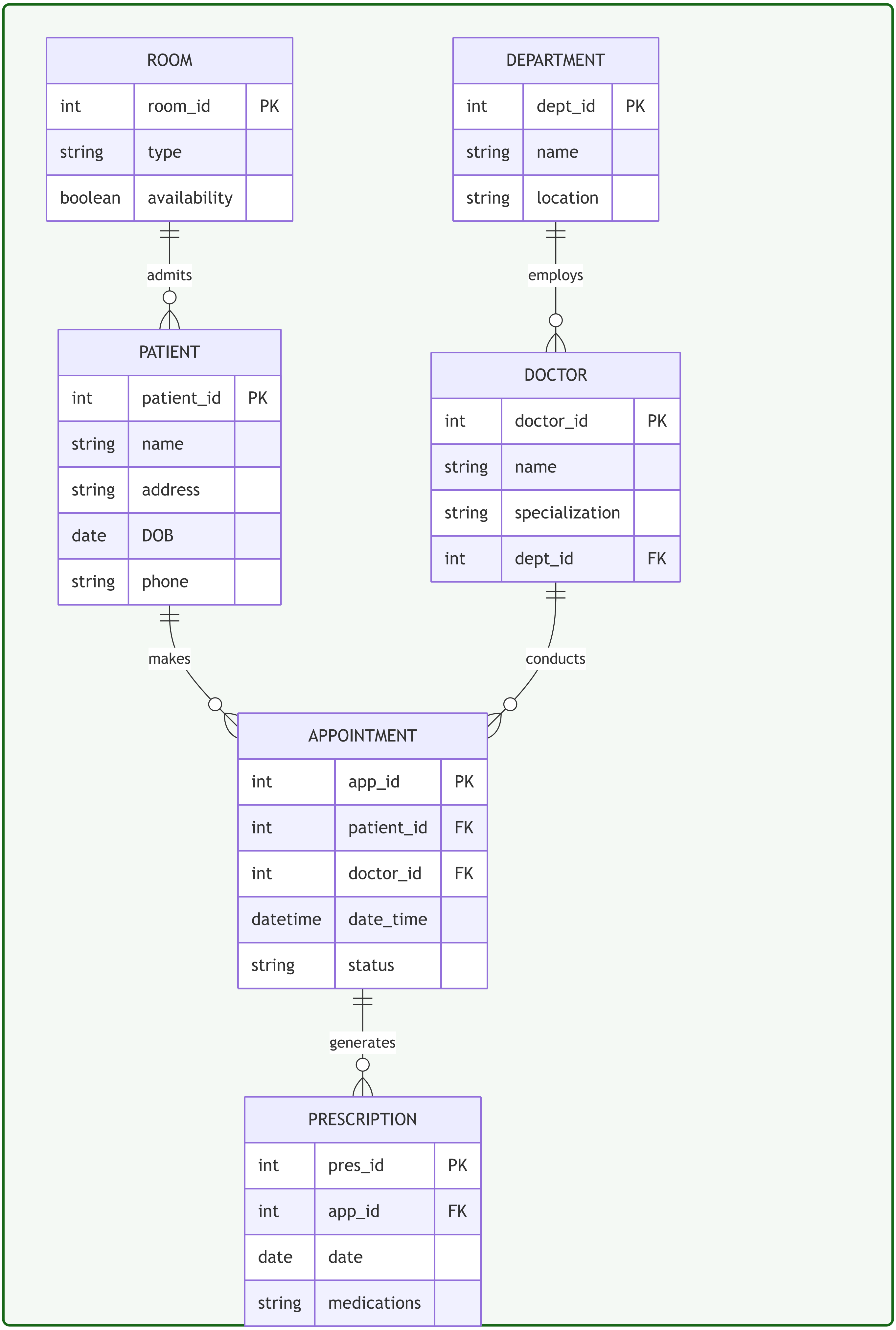
"PURE FIRE" - Primary Uniquely References Entities, Foreign Imports Referenced Entities

Question 2(c) [7 marks]

Construct an E-R diagram for Hospital Management System.

Solution

E-R Diagram for Hospital Management System:



ROOM		
int	room_id	PK
string	type	
boolean	availability	

DEPARTMENT		
int	dept_id	PK
string	name	
string	location	

PATIENT		
int	patient_id	PK
string	name	
string	address	
date	DOB	
string	phone	

DOCTOR		
int	doctor_id	PK
string	name	
string	specialization	
int	dept_id	FK

APPOINTMENT		
int	app_id	PK
int	patient_id	FK
int	doctor_id	FK
datetime	date_time	
string	status	

PRESCRIPTION		
int	pres_id	PK
int	app_id	FK
date	date	
string	medications	

Mnemonic

"PADRE" - Patients Appointments Doctors Rooms Entities

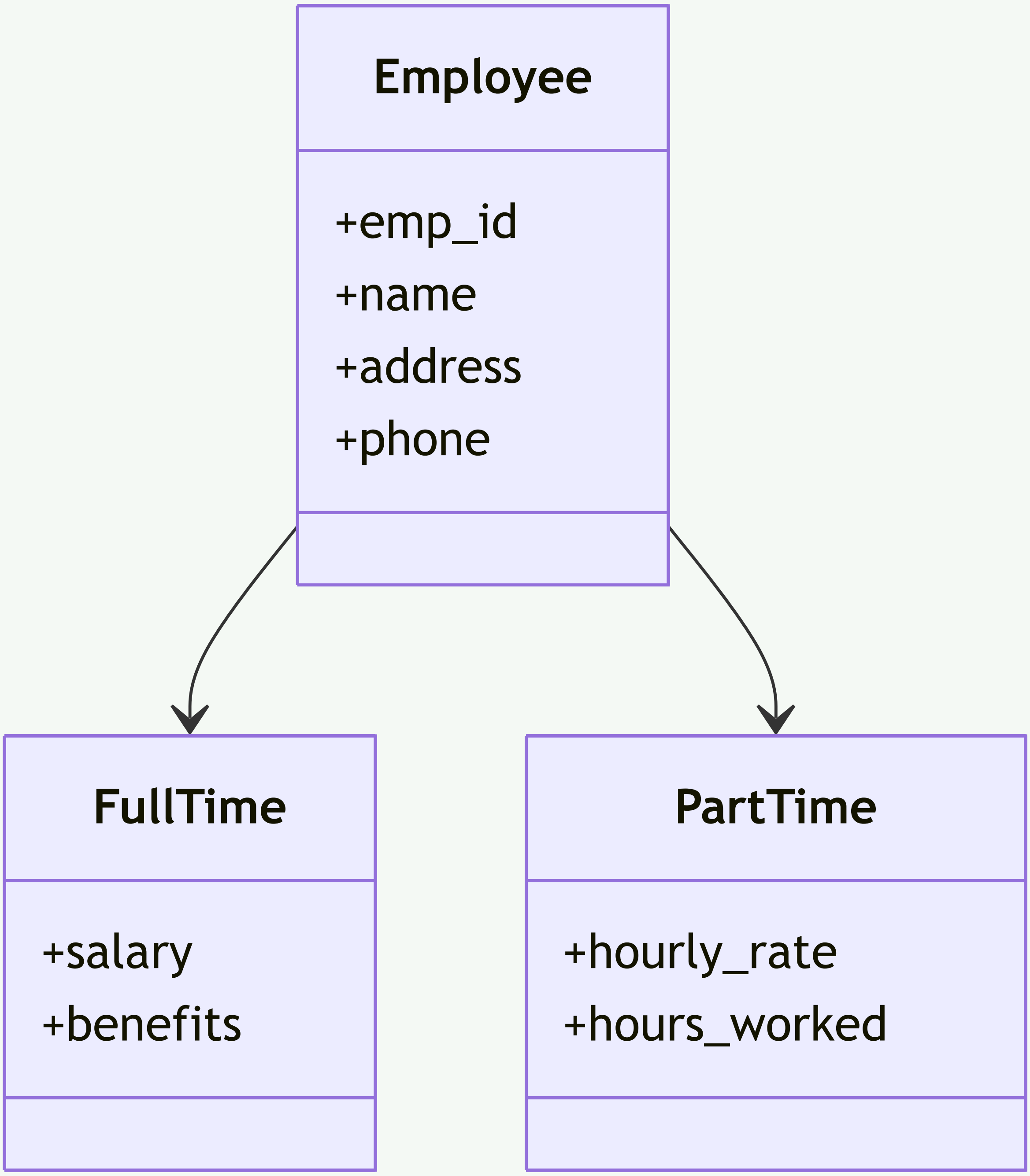
Question 2(a) OR [3 marks]

Draw figure and Explain Specialization.

Solution

Specialization: The process of creating new entities from an existing entity by adding unique attributes to distinguish them.

Diagram:



Mnemonic

"TDSB" - Top-Down Specialized Breakdown

Question 2(b) OR [4 marks]

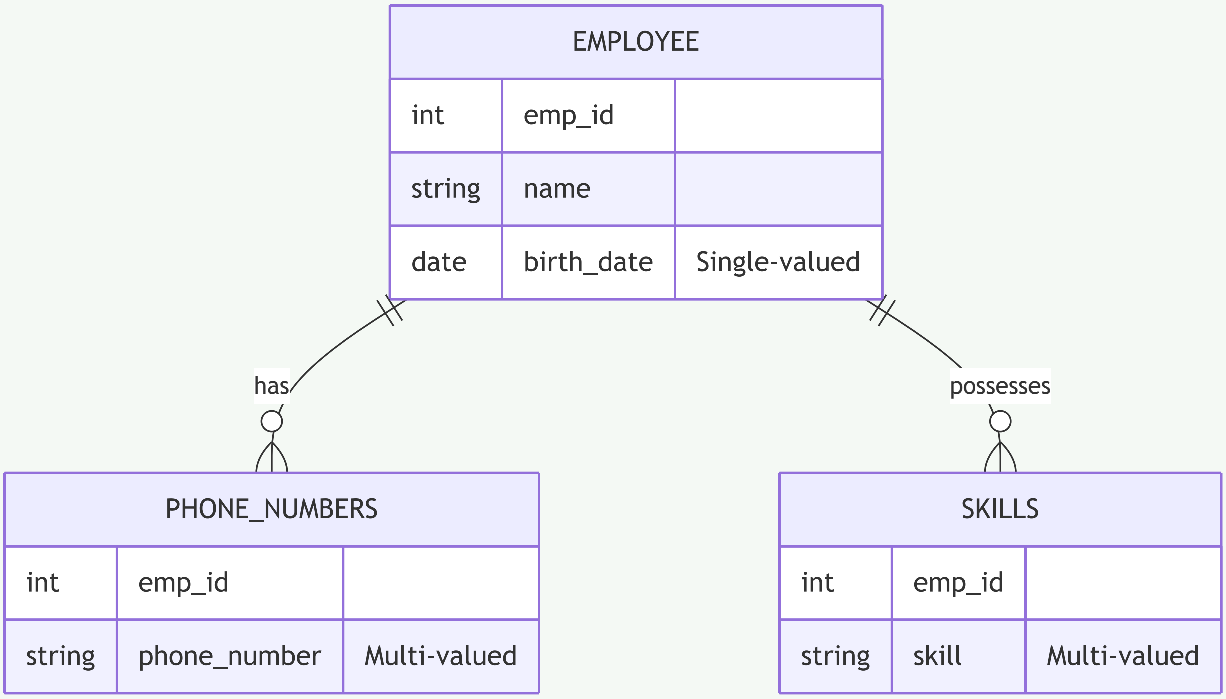
Explain single valued v/s multi-valued attributes with suitable examples.

Solution

Table 5: Single-valued vs Multi-valued Attributes

Type	Definition	Example	Implementation
Single-valued	Contains only one value for each entity instance	Person's birth date, SSN	Directly stored in table columns
Multi-valued	Can have multiple values for the same entity	Person's skills, phone numbers	Separate table or specialized formats

Diagram:



Mnemonic

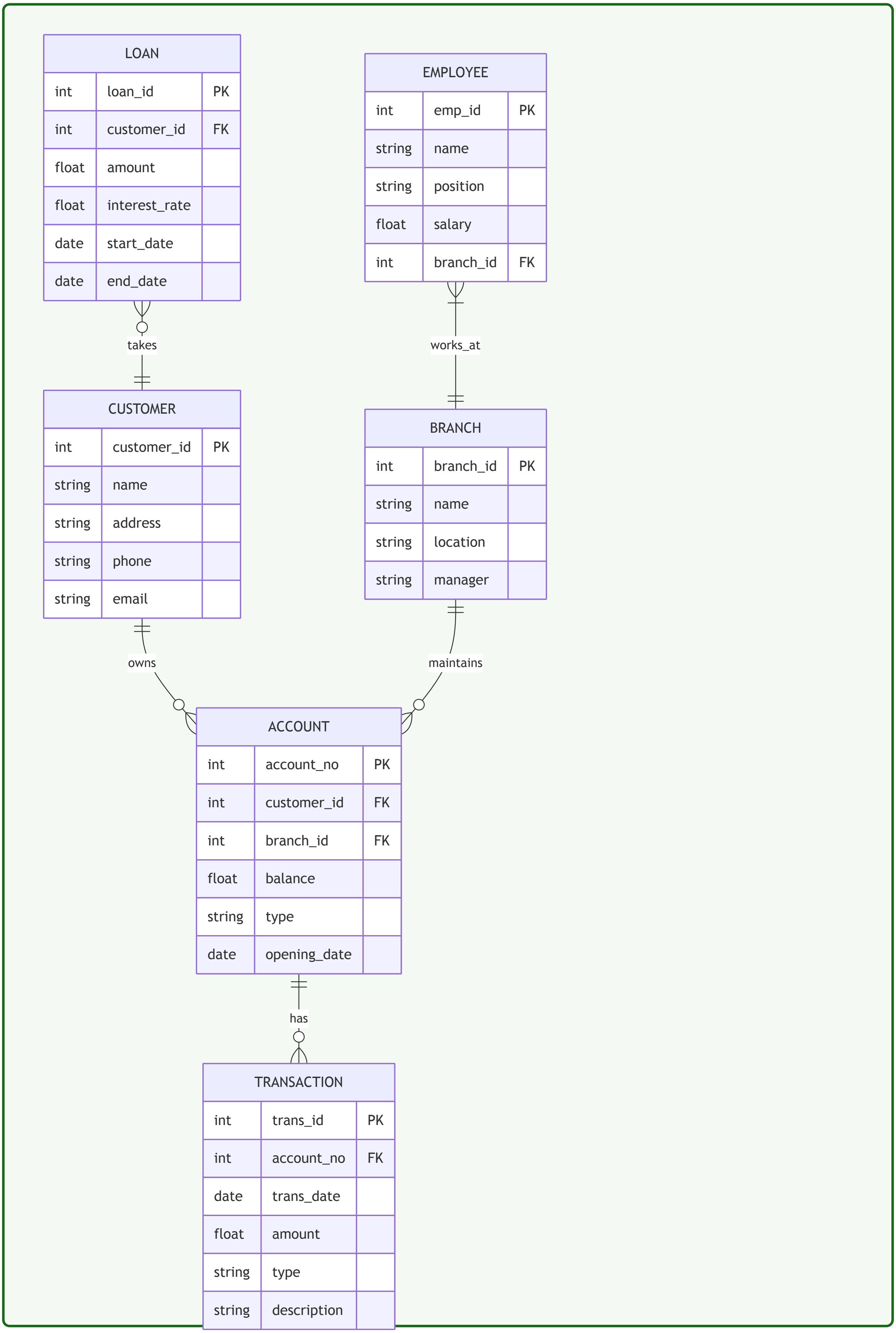
"SOME" - Single One, Multiple Entries

Question 2(c) OR [7 marks]

Construct an E-R diagram for Banking Management System.

Solution

E-R Diagram for Banking Management System:



LOAN		
int	loan_id	PK
int	customer_id	FK
float	amount	
float	interest_rate	
date	start_date	
date	end_date	

EMPLOYEE		
int	emp_id	PK
string	name	
string	position	
float	salary	
int	branch_id	FK

CUSTOMER		
int	customer_id	PK
string	name	
string	address	
string	phone	
string	email	

BRANCH		
int	branch_id	PK
string	name	
string	location	
string	manager	

ACCOUNT		
int	account_no	PK
int	customer_id	FK
int	branch_id	FK
float	balance	
string	type	
date	opening_date	

TRANSACTION		
int	trans_id	PK
int	account_no	FK
date	trans_date	
float	amount	
string	type	
string	description	

Mnemonic

"CABLE" - Customers Accounts Branches Loans Employees

Question 3(a) [3 marks]

Explain WHERE and DESC clause with example.

Solution

Table 6: WHERE and DESC Clauses

Clause	Purpose	Syntax	Example
WHERE	Filters rows based on specified condition	SELECT columns FROM table WHERE condition	SELECT * FROM employees WHERE salary > 50000
DESC	Sorts results in descending order	SELECT columns FROM table ORDER BY column DESC	SELECT * FROM products ORDER BY price DESC

Diagram:

```
-- Original data in Students table
| ID | Name   | Marks |
|----|--------|-------|
| 1  | Alice  | 85    |
| 2  | Bob    | 92    |
| 3  | Carol  | 78    |
| 4  | David  | 65    |

-- Using WHERE: SELECT * FROM Students WHERE Marks > 80
| ID | Name   | Marks |
|----|--------|-------|
| 1  | Alice  | 85    |
| 2  | Bob    | 92    |

-- Using DESC: SELECT * FROM Students ORDER BY Marks DESC
| ID | Name   | Marks |
|----|--------|-------|
| 2  | Bob    | 92    |
| 1  | Alice  | 85    |
| 3  | Carol  | 78    |
| 4  | David  | 65    |
```

Mnemonic

"WDF" - Where filters Data, DESC orders First-highest

Question 3(b) [4 marks]

List DDL commands. Explain any two DDL commands with examples.

Solution

DDL (Data Definition Language) Commands:

1. CREATE
2. ALTER
3. DROP
4. TRUNCATE
5. RENAME

Table 7: CREATE and ALTER Commands

Command	Purpose	Syntax	Example
CREATE	Creates database objects like tables, views, indexes	CREATE TABLE table_name (column definitions)	CREATE TABLE students (id INT PRIMARY KEY, name VARCHAR(50))
ALTER	Modifies structure of existing database objects	ALTER TABLE table_name action	ALTER TABLE students ADD COLUMN email VARCHAR(100)

CodeBlock:

```sql
-- CREATE example
CREATE TABLE employees (
    emp_id INT PRIMARY KEY,
    name VARCHAR(50) NOT NULL,
    dept VARCHAR(30),
    salary DECIMAL(10,2)
);

-- ALTER example
ALTER TABLE employees
ADD COLUMN hire_date DATE;
```

Mnemonic

"CADTR" - Create Alter Drop Truncate Rename

Question 3(c) [7 marks]

Perform the following Query on the table "Company" having the field's eno, ename, salary, dept in SQL. 1. Display all records in Company table. 2. Display only dept without duplicate value. 3. Display all records sorted in descending order of ename. 4. Add one new column "cityname" to store city. 5. Display name of all employees who do not stay in city "Mumbai". 6. Delete all employees having salary less than 10,000. 7. Display the employee names starts with "A".

Solution

CodeBlock:

```sql
-- 1. Display all records in Company table
SELECT * FROM Company;

-- 2. Display only dept without duplicate value
SELECT DISTINCT dept FROM Company;

-- 3. Display all records sorted in descending order of ename
SELECT * FROM Company ORDER BY ename DESC;

-- 4. Add one new column "cityname" to store city
ALTER TABLE Company ADD COLUMN cityname VARCHAR(50);

-- 5. Display name of all employees who do not stay in city "Mumbai"
SELECT ename FROM Company WHERE cityname != 'Mumbai';

-- 6. Delete all employees having salary less than 10,000
DELETE FROM Company WHERE salary < 10000;

-- 7. Display the employee names starts with "A"
SELECT ename FROM Company WHERE ename LIKE 'A%';
```

Table 8: SQL Operations

Operation	SQL Command	Purpose
SELECT	SELECT * FROM Company	Retrieve all data
DISTINCT	SELECT DISTINCT dept	Remove duplicates
ORDER BY	ORDER BY ename DESC	Sort in descending
ALTER	ALTER TABLE ADD COLUMN	Add new column
WHERE	WHERE cityname != 'Mumbai'	Filter condition
DELETE	DELETE FROM WHERE	Remove records
LIKE	WHERE ename LIKE 'A%'	Pattern matching

Mnemonic

"SODA-WDL" - Select Order Distinct Alter - Where Delete Like

Question 3(a) OR [3 marks]

Explain SELECT and DISTINCT clause with example.

Solution

Table 9: SELECT and DISTINCT Clauses

Clause	Purpose	Syntax	Example
SELECT	Retrieves data from database	SELECT columns FROM table	SELECT name, age FROM students
DISTINCT	Eliminates duplicate values	SELECT DISTINCT columns FROM table	SELECT DISTINCT department FROM employees

Diagram:

```
-- Original data in Departments table
| dept_id | dept_name |
|---------|-----------|
| 1       | Sales     |
| 2       | IT        |
| 3       | HR        |
| 4       | IT        |
| 5       | Sales     |

-- Using SELECT: SELECT dept_name FROM Departments
| dept_name |
|-----------|
| Sales     |
| IT        |
| HR        |
| IT        |
| Sales     |

-- Using DISTINCT: SELECT DISTINCT dept_name FROM Departments
| dept_name |
|-----------|
| Sales     |
| IT        |
| HR        |
```

Mnemonic

"SUD" - Select Unique with Distinct

Question 3(b) OR [4 marks]

List DML commands. Explain any two DML commands with examples.

Solution

DML (Data Manipulation Language) Commands:

1. INSERT
2. UPDATE
3. DELETE
4. SELECT

Table 10: INSERT and UPDATE Commands

Command	Purpose	Syntax	Example
INSERT	Adds new records to a table	INSERT INTO table_name VALUES (values)	INSERT INTO students VALUES (1, 'John', 85)
UPDATE	Modifies existing records	UPDATE table_name SET column=value WHERE condition	UPDATE students SET marks=90 WHERE id=1

CodeBlock:

```sql
-- INSERT example
INSERT INTO employees (emp_id, name, dept, salary)
VALUES (101, 'John Smith', 'IT', 65000);

-- UPDATE example
UPDATE employees
SET salary = 70000
WHERE emp_id = 101;
```

Mnemonic

"IUDS" - Insert Update Delete Select

Question 3(c) OR [7 marks]

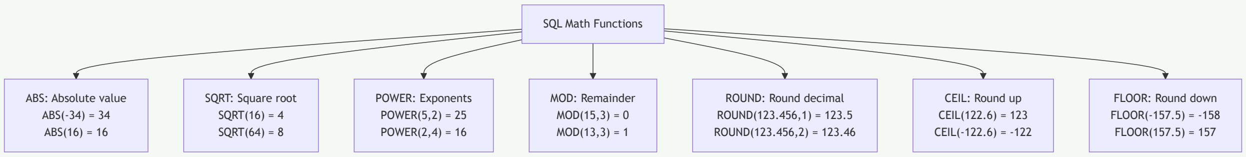
Write the Output of Following Query. 1. ABS(-34),ABS(16) 2. SQRT(16),SQRT(64) 3. POWER(5,2), POWER(2,4) 4. MOD(15,3), MOD(13,3) 5. ROUND(123.456,1), ROUND(123.456,2) 6. CEIL(122.6), CEIL(-122.6) 7. FLOOR(-157.5),FLOOR(157.5)

Solution

Table 11: SQL Function Outputs

Function	Description	Output
ABS(-34),ABS(16)	Absolute value	34, 16
SQRT(16),SQRT(64)	Square root	4, 8
POWER(5,2), POWER(2,4)	Power function	25, 16
MOD(15,3), MOD(13,3)	Modulus (remainder)	0, 1
ROUND(123.456,1), ROUND(123.456,2)	Round to decimal places	123.5, 123.46
CEIL(122.6), CEIL(-122.6)	Round up to nearest integer	123, -122
FLOOR(-157.5),FLOOR(157.5)	Round down to nearest integer	-158, 157

Diagram:



Mnemonic

"ASPRCF" - Absolute Square Power Remainder Ceiling Floor

Question 4(a) [3 marks]

List data types in SQL. Explain 1.VARCHAR() and 2.INT() data types with example.

Solution

SQL Data Types Categories:

1. Numeric (INT, FLOAT, DECIMAL)
2. Character (CHAR, VARCHAR)
3. Date/Time (DATE, TIME, DATETIME)
4. Binary (BLOB, BINARY)
5. Boolean (BOOL)

Table 12: VARCHAR and INT Data Types

Data Type	Description	Size	Example
VARCHAR(n)	Variable-length character string	Up to n characters, only uses needed space	VARCHAR(50) for names, emails
INT	Integer numeric data	Usually 4 bytes, -2,147,483,648 to 2,147,483,647	INT for IDs, counts, ages

CodeBlock:

```sql
CREATE TABLE students (
    student_id INT PRIMARY KEY,
    name VARCHAR(50) NOT NULL,
    age INT,
    email VARCHAR(100)
);
```

Mnemonic

"VIA" - Variable strings, Integers for Ages

Question 4(b) [4 marks]

Explain 2NF (Second Normal Form) with example and solution.

Solution

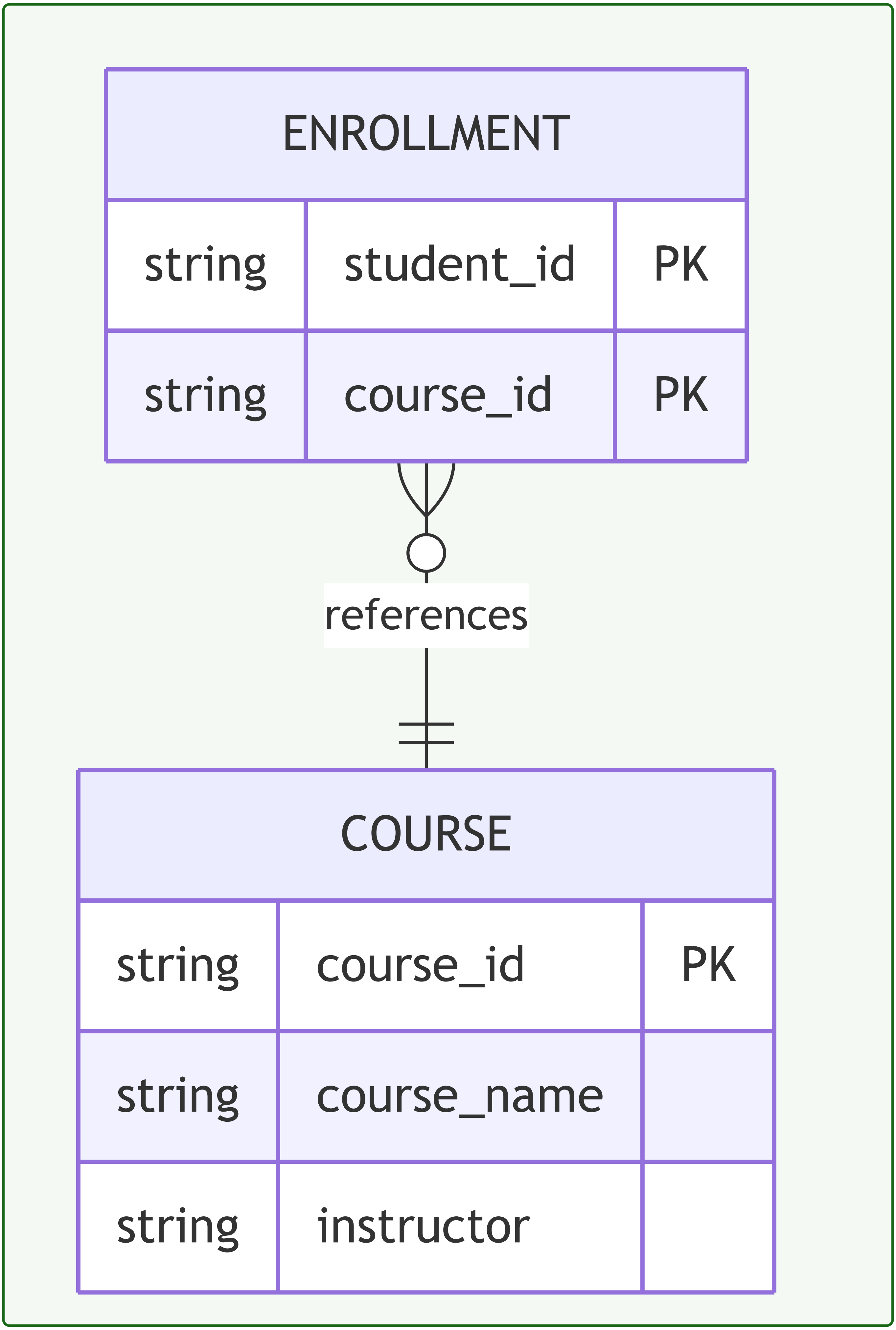
2NF Definition: A relation is in 2NF if it is in 1NF and no non-prime attribute is dependent on any proper subset of any candidate key.

Table 13: Before 2NF

student_id	course_id	course_name	instructor
S1	C1	Database	Prof. Smith
S1	C2	Networking	Prof. Jones
S2	C1	Database	Prof. Smith
S3	C3	Programming	Prof. Wilson

Problem: Non-prime attributes (course_name, instructor) depend only on course_id, not the entire key (student_id, course_id).

Diagram: 2NF Solution



ENROLLMENT

string	student_id	PK
string	course_id	PK

COURSE

string	course_id	PK
string	course_name	
string	instructor	

Table 14: After 2NF

student_id	course_id
S1	C1
S1	C2
S2	C1
S3	C3

Course Table:

course_id	course_name	instructor
C1	Database	Prof. Smith
C2	Networking	Prof. Jones
C3	Programming	Prof. Wilson

Mnemonic

"PFPK" - Partial Functional dependency on Primary Key

Question 4(c) [7 marks]

Explain function dependency. Explain Partial function dependency with example.

Solution

Functional Dependency: Relationship between attributes where one attribute's value determines another attribute's value.
Notation: X $\rightarrow Y (X determines Y)$
Partial Functional Dependency: When a non-prime attribute depends on part of a composite key rather than the whole key.

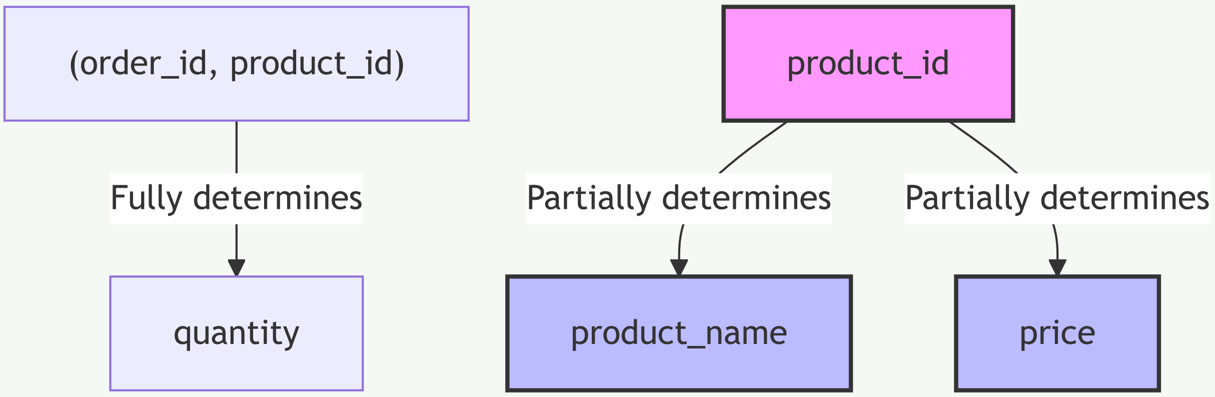
Table 15: Order Details (Before Normalization)

order_id	product_id	quantity	product_name	price
O1	P1	5	Keyboard	50
O1	P2	2	Mouse	25
O2	P1	1	Keyboard	50
O3	P3	3	Monitor	200

Functional Dependencies:

- (order_id, product_id) → *quantity*
- product_id → *product_name*
- product_id → *price*

Diagram:



Solution (Normalized Tables): Orders Table:

order_id	product_id	quantity
O1	P1	5
O1	P2	2
O2	P1	1
O3	P3	3

Products Table:

product_id	product_name	price
P1	Keyboard	50
P2	Mouse	25
P3	Monitor	200

Mnemonic

"PDPK" - Partial Dependency on Part of Key

Question 4(a) OR [3 marks]

Explain commands: 1) To_Char() 2) To_Date()

Solution

Table 16: Conversion Functions

Function	Purpose	Syntax	Example
TO_CHAR()	Converts date/number to character string using format model	TO_CHAR(value, [format])	TO_CHAR(SYSDATE, 'DD-MON-YYYY') → $'14-JUN-2024'$
TO_DATE()	Converts character string to date using format model	TO_DATE(string, [format])	TO_DATE('14-JUN-2024', 'DD-MON-YYYY') → $date value$

CodeBlock:

```
-- TO_CHAR examples
SELECT TO_CHAR(SYSDATE, 'DD-MON-YYYY') FROM DUAL;  -- '14-JUN-2024'
SELECT TO_CHAR(1234.56, '$9,999.99') FROM DUAL;    -- '$1,234.56'

-- TO_DATE examples
SELECT TO_DATE('2024-06-14', 'YYYY-MM-DD') FROM DUAL;
SELECT TO_DATE('14/06/24', 'DD/MM/YY') FROM DUAL;
```

Mnemonic

"DCS" - Date Conversion Strings

Question 4(b) OR [4 marks]

Explain Full function dependency with example.

Solution

Full Functional Dependency: When an attribute is functionally dependent on a composite key, and dependent on the entire key, not just part of it.

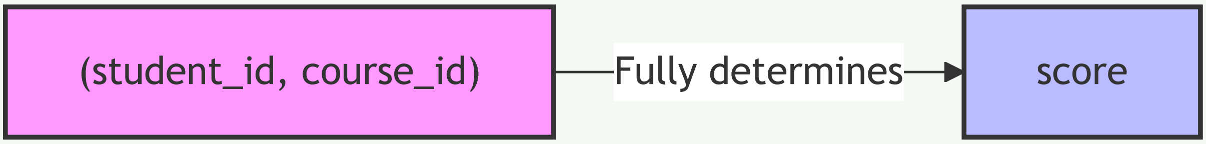
Table 17: Exam Results

student_id	course_id	exam_date	score
S1	C1	2024-05-10	85
S1	C2	2024-05-15	92
S2	C1	2024-05-10	78
S2	C2	2024-05-15	88

Full Functional Dependency:

- (student_id, course_id) $\rightarrow score(scoredependsonbothstudentandcourse)$

Diagram:



Explanation: The score attribute fully depends on the composite key (student_id, course_id) because:

- Different students can have different scores for the same course
- Same student can have different scores for different courses
- We need both student_id and course_id to determine a specific score

Mnemonic

"FCEK" - Fully dependent on Complete/Entire Key

Question 4(c) OR [7 marks]

Define normalization. Explain 1NF (First Normal Form) with example and solution.

Solution

Normalization: Process of organizing data to minimize redundancy, improve data integrity, and eliminate anomalies by dividing larger tables into smaller related tables.

1NF Definition: A relation is in 1NF if all attributes contain atomic (indivisible) values only.

Table 18: Before 1NF

student_id	name	courses
S1	John	Math, Physics
S2	Mary	Chemistry, Biology, Physics
S3	Tim	Computer Science

Problems:

- Non-atomic values (multiple courses per cell)
- Cannot easily query or update specific courses

Diagram:

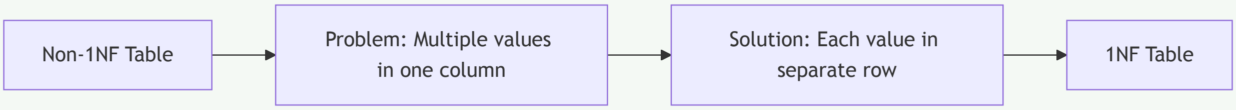

Non-1NF Table
Problem: Multiple values in one column
Solution: Each value in separate row
1NF Table

Table 19: After 1NF

student_id	name	course
S1	John	Math
S1	John	Physics
S2	Mary	Chemistry
S2	Mary	Biology
S2	Mary	Physics
S3	Tim	Computer Science

Mnemonic

"ASAV" - Atomic Single-value Attributes only Valid

Question 5(a) [3 marks]

Explain the concept of Transaction with example.

Solution

Transaction: A logical unit of work that must be either completely executed or completely undone.

Table 20: Transaction Properties

Property	Description
Atomicity	All operations complete successfully or none do
Consistency	Database remains in consistent state before and after transaction
Isolation	Concurrent transactions don't interfere with each other
Durability	Completed transactions persist even after system failures

Example:

```sql
-- Bank Account Transfer Transaction
BEGIN TRANSACTION;
    -- Deduct $500 from Account A
    UPDATE accounts SET balance = balance - 500 WHERE account_id = 'A';

    -- Add $500 to Account B
    UPDATE accounts SET balance = balance + 500 WHERE account_id = 'B';

    -- If both operations successful
    COMMIT;
    -- If any operation fails
    -- ROLLBACK;
END TRANSACTION;
```

Mnemonic

“ACID” - Atomicity Consistency Isolation Durability

Question 5(b) [4 marks]

Explain equi join with syntax and example.

Solution

Equi Join: A join that uses equality comparison operator to match records from two or more tables based on a common field.

Syntax:

```sql
SELECT columns
FROM table1, table2
WHERE table1.column = table2.column;

-- Alternative syntax (explicit JOIN)
SELECT columns
FROM table1 JOIN table2
ON table1.column = table2.column;
```

Table Example: Employees Table:

emp_id	name	dept_id
101	Alice	1
102	Bob	2
103	Carol	1

Departments Table:

dept_id	dept_name	location
1	HR	New York
2	IT	Chicago
3	Finance	Boston

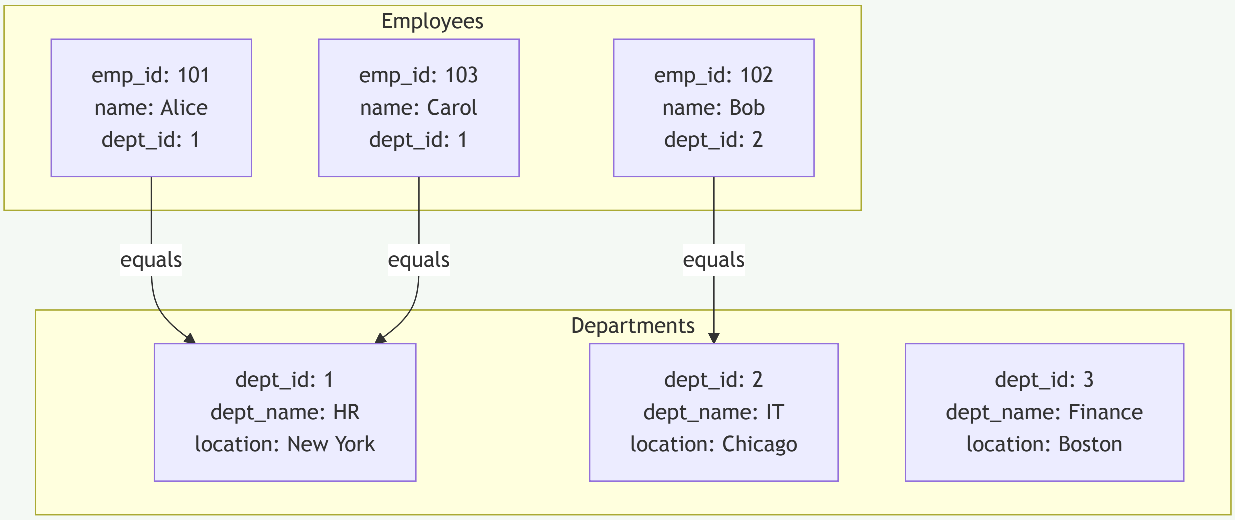
CodeBlock:

```
-- Equi Join Example
SELECT e.name, d.dept_name, d.location
FROM employees e, departments d
WHERE e.dept_id = d.dept_id;
```

Result:

name	dept_name	location
Alice	HR	New York
Bob	IT	Chicago
Carol	HR	New York

Diagram:



Mnemonic

"MEET" - Match Equal Elements Every Table

Question 5(c) [7 marks]

Explain Conflict Serializability in detail.

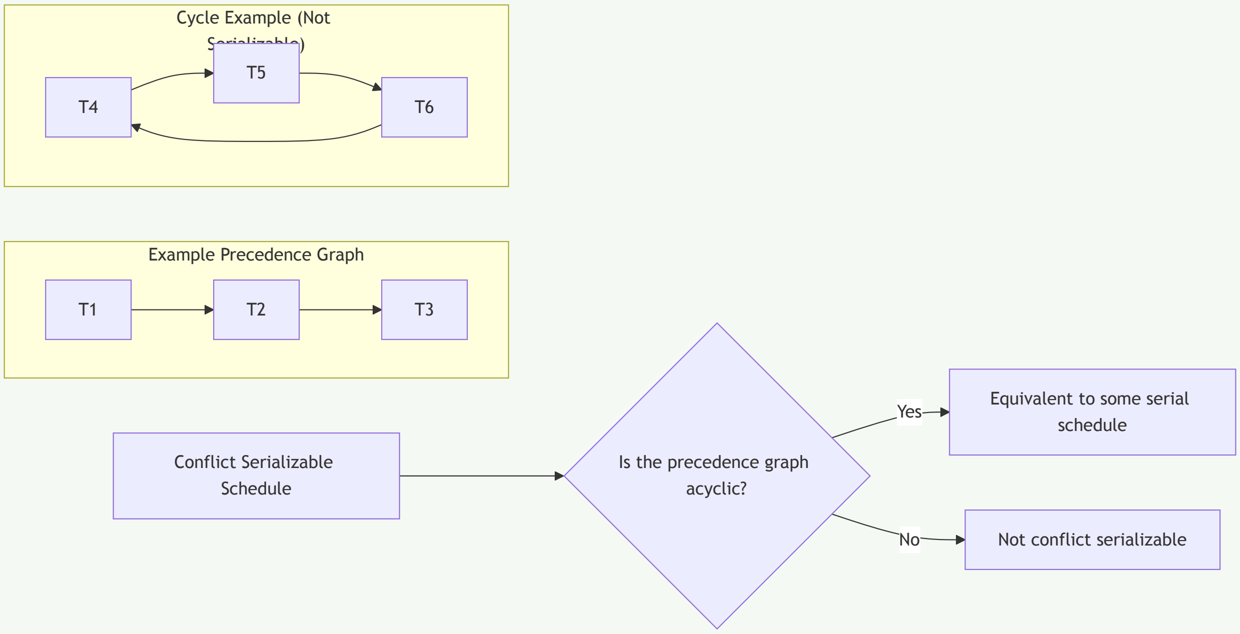
Solution

Conflict Serializability: A way to ensure correctness of concurrent transactions by guaranteeing that the execution schedule is equivalent to some serial execution.

Table 21: Key Concepts in Conflict Serializability

Concept	Description
Conflicting Operations	Two operations conflict if they access same data item and at least one is a write
Precedence Graph	Directed graph showing conflicts between transactions
Conflict Serializable	Schedule is conflict serializable if its precedence graph is acyclic

Diagram:


Cycle Example (Not Serializable)
T4
T5
T6
Example Precedence Graph
T1
T2
T3
Conflict Serializable Schedule
Is the precedence graph acyclic?
Yes
Equivalent to some serial schedule
No
Not conflict serializable

Example: Consider transactions T1 and T2:

- T1: Read(A), Write(A)
- T2: Read(A), Write(A)

Schedule S1: R1(A), W1(A), R2(A), W2(A) - Serializable (equivalent to T12) Schedule S2: R1(A), R2(A), W1(A), W2(A) - Not serializable (contains cycle in precedence graph)

Steps to Determine Conflict Serializability:

1. Identify all pairs of conflicting operations
2. Construct the precedence graph
3. Check if the graph has cycles
4. If no cycles, the schedule is conflict serializable

Mnemonic

"COPS" - Conflicts, Operations, Precedence, Serializability

Question 5(a) OR [3 marks]

Explain the properties of Transaction with example.

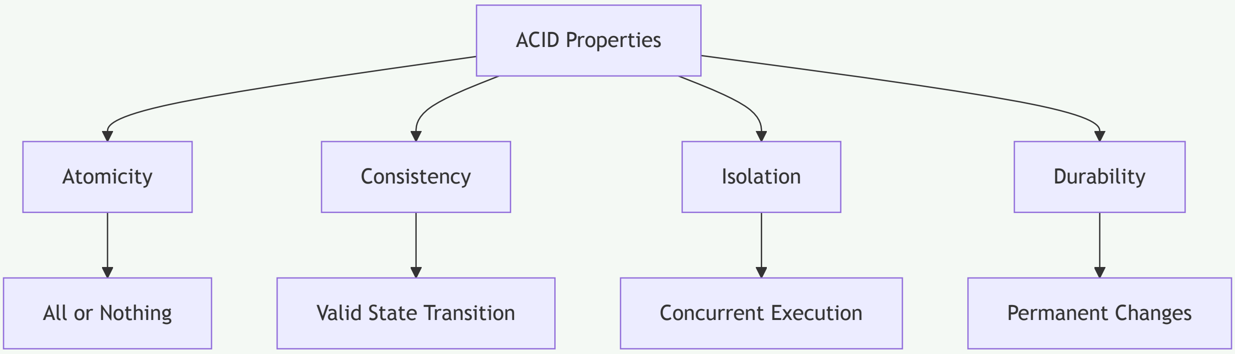
Solution

ACID Properties of Transactions:

Table 22: ACID Properties

Property	Description	Example
Atomicity	All operations complete successfully or none do	Bank transfer - both debit and credit must succeed or fail together
Consistency	Database must be in a consistent state before and after transaction	After transferring $100, total money in system remains unchanged
Isolation	Concurrent transactions don't interfere with each other	Transaction A doesn't see partial results of Transaction B
Durability	Once committed, changes are permanent	Power failure won't cause committed transaction to be lost

Diagram:



Example:

```sql
-- ATM Withdrawal Transaction
BEGIN TRANSACTION;
    -- Check balance
    SELECT balance FROM accounts WHERE account_id = 'A123';

    -- If sufficient, update balance
    UPDATE accounts SET balance = balance - 100 WHERE account_id = 'A123';

    -- Record the withdrawal
    INSERT INTO transactions (account_id, type, amount, date)
    VALUES ('A123', 'WITHDRAWAL', 100, SYSDATE);

    -- If all operations successful
    COMMIT;
    -- If any operation fails
    -- ROLLBACK;
END TRANSACTION;
```

Mnemonic

"ACID" - Atomicity Consistency Isolation Durability

Question 5(b) OR [4 marks]

Write the Queries using set operators to find following using given "Faculty" and "CT" tables. 1. List the name of the persons who are either a Faculty or a CT. 2. List the name of the persons who are a Faculty as well as a CT. 3. List the name of the persons who are only a Faculty and not a CT. 4. List the name of the persons who are only a CT and not a Faculty.

Solution

Table Data: Faculty Table:

FacultyName	ErNo	Dept
Prakash	FC01	ICT
Ronak	FC02	IT
Rakesh	FC03	EC
Kinjal	FC04	ICT

CT (Class Teacher) Table:

Dept	CTName
EC	Rakesh
CE	Jigar
ICT	Prakash
IT	Gunjan

CodeBlock:

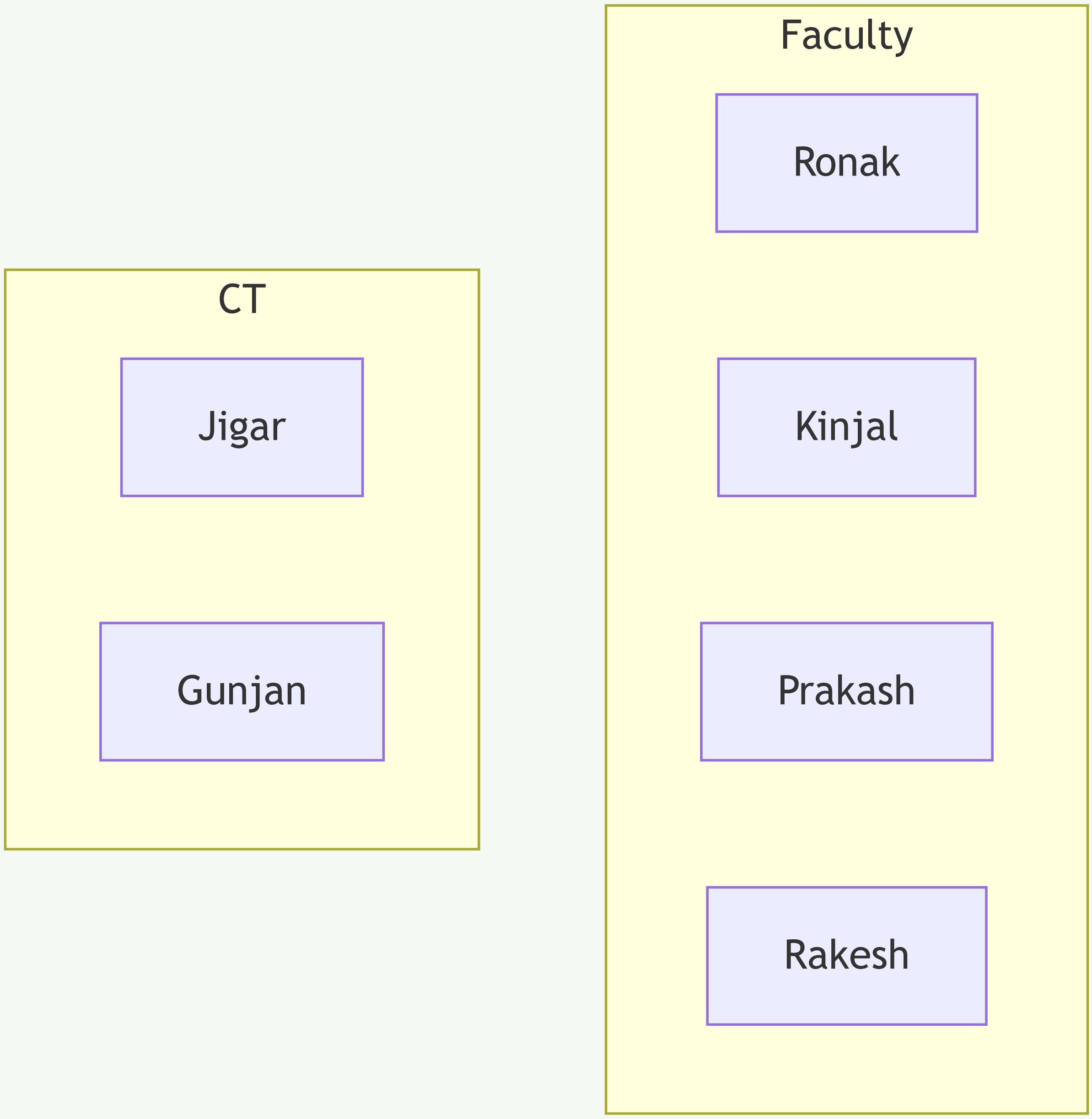
```sql
-- 1. List the name of the persons who are either a Faculty or a CT
SELECT FacultyName AS Name FROM Faculty
UNION
SELECT CTName AS Name FROM CT;

-- 2. List the name of the persons who are a Faculty as well as a CT
SELECT FacultyName AS Name FROM Faculty
INTERSECT
SELECT CTName AS Name FROM CT;

-- 3. List the name of the persons who are only a Faculty and not a CT
SELECT FacultyName AS Name FROM Faculty
MINUS
SELECT CTName AS Name FROM CT;

-- 4. List the name of the persons who are only a CT and not a Faculty
SELECT CTName AS Name FROM CT
MINUS
SELECT FacultyName AS Name FROM Faculty;
```

Diagram:



Results:

1. UNION: Prakash, Ronak, Rakesh, Kinjal, Jigar, Gunjan
2. INTERSECT: Prakash, Rakesh
3. MINUS (Faculty - CT): Ronak, Kinjal
4. MINUS (CT - Faculty): Jigar, Gunjan

Mnemonic

"UIMM" - Union Intersect Minus Minus

Question 5(c) OR [7 marks]

Explain View Serializability in detail.

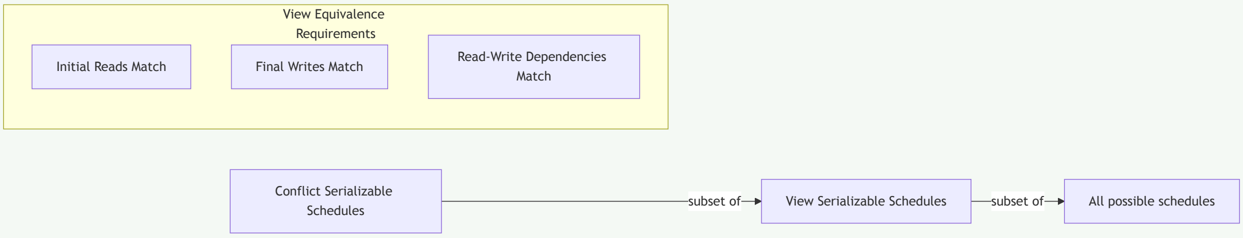
Solution

View Serializability: A schedule is view serializable if it is view equivalent to some serial schedule, meaning it produces the same "view" (or final state) of the database.

Table 23: Comparison with Conflict Serializability

Aspect	View Serializability	Conflict Serializability
Definition	Based on the final results of reads and writes	Based on conflicts between operations
Condition	Preserves initial read, final write, and read-write dependency	Preserves all conflicts between operations
Scope	Broader class of schedules	Subset of view serializable schedules
Testing	More complex to test	Can test with precedence graph

Diagram:


View Equivalence Requirements
Initial Reads Match
Final Writes Match
Read-Write Dependencies Match
Conflict Serializable Schedules
subset of
View Serializable Schedules
subset of
All possible schedules

View Equivalence Conditions:

1. Initial Reads: If T1 reads an initial value of data item A in schedule S1, it must also read the initial value in S2.
2. Final Writes: If T1 performs the final write on data item A in S1, it must also perform the final write in S2.
3. Read-Write Dependency: If T1 reads a value of A written by T2 in S1, it must also read the value written by T2 in S2.

Example of View Serializable but not Conflict Serializable Schedule: Consider transactions with blind writes (writes without reading):

- T1: W1(A)
- T2: W2(A)

Schedule S: W1(A), W2(A) - View serializable to both T12 and T21 (final write is always T2) But W1(A) and W2(A) conflict, so a conflict graph would have an edge in both directions.

Mnemonic

"IRF" - Initial reads, Result writes, Final view