Names: Hieu Pham, Cindy Chen, Barry Vang, Natalie Klang

Metro State University
ICS-311-50 Summer 2023
Class Assignment 1

Question 1 (5 Points)

Given the following database instance, answer the questions below.

Employee

emp_code	emp_lname	job_code
EC14	Rudell	JC4
EC15	McDade	JC1
EC16	Ruellardo	JC1
EC17	Smith	JC3
EC20	Smith	JC2

Plan

plan_code	plan_description
1	Term Life
2	Stock Purchase
3	Long-term disability
3	Extra Week Of PTO
4	Dental

Job

job_code	job_description
JC1	Clerical
JC2	Technical
JC3	DBA
JC4	Manager

Benefit

emp_code	plan_code
EC15	3
EC16	1

EC17	1
EC17	3
EC17	4
EC20	3

Extra_Benefit

job_code	plan_code
JC4	2

Assume that the following attributes are the primary keys for the tables:

emp_code is the primary key for **Employee** table
job_code is the primary key for the **Job** table
plan_code is the primary key for the **Plan** table
emp_code, plan_code is a composite primary key for the **Benefit** table
job_code, plan_code is the composite primary key for the **Extra_Benefit** table

a) Do all tables exhibit entity integrity? Answer yes or no and then explain your answer. (2.5 Points)

Characteristics of Entity Integrity: The primary key uniquely identifies each row and shouldn't be null value.

Employee – Yes. Emp_code values are unique and not null.
Plan – No. plan_code values are not all unique.
Job – Yes. Job_code values are unique and not null.
Benefit – Yes. Composite key emp_code, plan_code values are unique and not null.
Extra Benefit – Yes. Composite key job_code, plan_code values are unique and not null.

b) For each table in the database, identify foreign key(s) (if any). For each foreign key, state the referencing relation and the referenced relation. (2.5 Points)

Foreign Key	Referencing Relation	Referenced Relation
job_code	Employee	Job
plan_code	Benefit	Plan
emp_code	Benefit	Employee
job_code	Extra_Benefit	Job

Foreign Key is an attribute in one table and value refer to an attribute of another referenced relation (table).

Question 2 (5 Points)

Given the following relational database schema (primary keys are bold and underlined). Answer the questions below:

*branch(**branch_id**, branch_name, branch_city, assets)*
*customer(**customer_id**, customer_name, custome_str, customer_city, customer_st, customer_zip)*
*loan(**loan_number**, branch_id, amount)*
*borrower(**customer_id**, **loan_number**)*
*account(**account_number**, branch_id, balance)*
*depositor(**customer_id, account_number**)*

a) Devise a reasonable database instance by filling the tables with data of your choice. Make sure to have at least 3 tuples in each table. Make sure that all tables exhibit entity integrity and referential integrity constraints. Make sure to use good table layout in your answer. (3 points)

branch

branch_id	branch_name	branch_city	assets
1234	West	Minneapolis	100000
1235	East	St. Paul	50000
1236	North	Anoka	25000

customer

customer_id	customer_name	customer_str	customer_city	customer_st	customer_zip
0001	Barry Vang	123 Main St	Minneapolis	MN	55408
0002	Hieu Pham	456 South St	Bloomintgon	MN	55437
0003	Natalie Klang	789 Little St	Edina	MN	55389

loan

loan_number	branch_id	amount
1000	1234	4000
1001	1235	6000
1002	1235	1000

borrower

customer_id	loan_number
0001	**1000**
0002	**1001**
0003	**1002**

account

account_number	branch_id	balance
1234567	1234	5000
1234568	1234	2500
1234569	1236	1000

depositor

customer_id	account_number
0001	**1234567**
0002	**1234568**
0003	**1234569**

b) For each of the following relational algebra expressions, explain the output of the expression in words: (1 point)

- $\Pi_{branch\_name,\ branch\_city}(\sigma_{assets\ >102000.00}$ (branch)

  Select branch_name and branch_city for assets greater than 102000.

c) For each of the following queries, write a relational algebra expression to answer the query: (1 point)

- Find the names of all customers who live in Brewster, and have the name Hopkins.

  Π customer_name (σ customer_city = “Brewster” AND customer_name = Hopkins” (customer)