Metropolitan State University
ICS 311 —Database Management Systems

Homework #2

Due: See Syllabus

Total: 16 Points

Question 1 (7 Points):

Given the following database instance, answer questions 1.1 through 1.3:

Employee

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

Plan

plan_code	plan_description
1	Term Life
6	Stock Purchase
3	Long-term disability
4	Dental
2	Extra Vacation
5	Long-term disability

Job

job_code	job_description
JC1	Clerical
JC2	Technical
JC4	DBA
JC3	Manager

Benefit

JC2	Accountant

emp_code	plan_code
EC15	3
EC16	1
EC17	1
EC14	3
EC17	4

Extra_Benefit

job_code	plan_code
JC3	6

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

1.1 (2 Points) Do all tables exhibit entity integrity? Answer yes or no and then explain your answer.

Entity integrity means no duplicate primary keys, that means no duplicate data in each tables primary so therefore, in the given tables, *Employees, Plan and Job* tables are the ones that have Primary Keys while *Benefit and Extra_Benefit* has Composite primary keys. Composite primary keys cannot be considered as unique since it only serves as a foreign key to relate tables.. Which means that the records/data may repeat. Maybe, if you set *record_id* as primary keys for Benefit and Extra_Benefit, only then it exhibits entity integrity.

1.2 (3 Points) For each table in the database, identify foreign key(s) (if any). For each foreign key, state the referencing relation and the referenced relation (USE THE TABLE LAYOUT FROM POWER POINT SLIDE 19, IN Old_Chapter2.ppt Power Point slides in D2L)

Referencingrelation	Foreign key	Referenced relation
Employee	job_code	Job
Plan	None	None
Job	None	None
Benefit	emp_code, plan_code	Employee,plan
extra_benefit	jobe_code, plan_code	Job, plan

1.3 (2 Point) Do all tables exhibit referential integrity? Answer yes or no (for each table) and then explain your answer.

Referential integrity means that any foreign key matches a primary key, a foreign key is a column in one table that uses the data from a primary key in another table. This creates a relationship between the tables. The employee table s primarily key was *emp_code, emp_code* was then used in the benefits table. *plan_code* is the primary key for the Plantable, *plan_code was then used again in* the extra benefit and benefit table. Job_code is the primary key for the job table and is used again in employee, benefit, and extra benefit tables.

Question 2 (9 Points):

Given the following relational database schema (primary keys are bold and underlined). Answer questions 2.1 to 2.4:

*Orders(**orderId**, customerId, dateOrdered, dateRequired, status)*

*Customer(**customerId**, customerLastName, customerStreet, customerCity, customerState, customerZip, creditRating)*

*OrderDetails(**orderId,productId**, quantity, lineNumber, amount)*

*Products(**productId**, name, description, quantity, unitPrice)*

*CreditTerms(**creditRating**, creditTerms)*

2.1 (2 Points) List all possible foreign keys. For each foreign key list both the referencing and referenced relations. (Note: remember to use the table layout used in the text book to answer this question correctly).

ReferencingRelation	Foreign Key	Referenced relation
Orders	customerId	Customer
OrderDetails	orderId, productId	Orders, Products
Customer	creditRating	CreditTerms
CreditTerms	None	None
Products	None	None

2.2 (2 Points) Devise a reasonable database instance by filling the tables with data of your choice. Make sure to have at least 2 tuples in each table. Make sure that all tables exhibits entity integrity and referential integrity constraints. Make sure to use good grid table layout in your answer.

Products

productId	name	description	quantity	unitPrice
310784	Cookies	Butter	10	20
310785	Chocolates	Dark	15	23.45

CreditTerms

creditRating	CreditTerms
10	2 Months
15	1 Month

Customer

CustomerID	CustomerLastName	customerStreet	customerCity	customerZip	creditRating
1001	Smith	St. Anns St.	Hopkins	55305	10
1002	Williams	10 Sterling st.	Chicago	60007	NULL

Orders

orderID	customerID	dateOrdered	dateRequired	status
1	1001	20-05-2021	25-05-2021	Ready
2	1002	24-05-2021	26-05-2021	InProcess

OrderDetails

orderID	productID	quantity	lineNumber	amount
1	310784	2	1	40
1	310785	1	2	23.45
2	310784	1	1	20

2.3 (3 Points) For each of the following queries, write a relational algebra expression to answer the query:

a) Find the id and last names of all customers who live on St. Anns St. in Hopkins.

∏ customerID, customerLastName (σ customerStreet = 'St. Anns St.' and customerCity = 'Hopkins' (Customer))

b) Find the Customer's last name and street address of all customers who have a Credit Term.

∏ customerLastName, customerStreet (σ Customer ⋈ CreditTerms)

c) Find the names, street address, and cities of residence for all customers who have ordered product number 310784.

∏ customerLastName, customerStreet, customerCity (σ productID = 310784 (Customers ⋈ Orders ⋈ OrderDetails))

2.4 (2 point) For each of the following relational algebra expressions, explain the output of the expression in words:

a) $\Pi_{product\_id,\ name}(\sigma_{unitPrice=23.45}(products)$

Select product_id and name from Products where unit price is equal to '23.45'

b) $\Pi_{customerId,customerLastName,orderId,status}(\sigma_{customerCity='chicago'}$ (customer $\bowtie$ orders)

Find the customerId, customerLastName, his orderId and status of all orders for the customers who reside in 'chicago'