Lab 2

1. Use the sample of a database shown below to work Problems 1.1 through 1.5.
This database has 3 relations.

1.1[1] For each of the tables in the database, identify super keys, candidate keys, primary key and the foreign keys. If a table does not have a foreign key, write NONE.

Ans :-

Assume every student has a unique phone number

Relations	Super key	Candidate key	Primary key	Foreign key
Student	(STD_ID),(PHONE),(STD_ID,SF_NAME), (STD_ID,SLNAME)(STD_ID,PHONE) (STD_ID,MAJOR)	(STD_ID) (PHONE)	STD_ID	NONE
Course	(C_CODE),(CRS_NAME) (C_CODE,CRDT)(CRS_NAME,CRDT)	(C_CODE) (CRS_NAME)	C_CODE	NONE
Grade	NONE	NONE	NONE	CRS_NAME

1.2 (1) Do the tables exhibit entity integrity? Answer Yes or No, then justify your answer.

ANS:

YES, because none of the primary key in the relations is null.

1.3(1) Do the tables exhibit referential integrity? Answer Yes or No, then justify your answer.

ANS:

YES, because every foreign key value match a tuple in their home relation.

1.4(1) Comment on each table. Can you propose a better organization of data? Justify your answer.

ANS:

- Student Relation looks fine.
- Course Relation violates the Relation property that each cell should have one

  atomic value but the Qualified faculty column contains more than one value.

  a better solution would be to have separate column for each qualified faculty.

- Grade relation: would have been better if it had Course code and student id as the

  foreign keys.

1.5(1) For each of the tables in the database, create two new rows such that first one violates entity integrity and the second one violates referential integrity. If such a row does not exist, write NONE.

ANS:

STUDENT

SDT_ID	SF_NAME	SLNAME	PHONE	MAJOR
935499	Jill	Meek	(345)345-5216	CSC
355869	Cathy	Liu	(356)467-7488	PHY
577885	James	Smith	(456)435-4658	CHM
127345	Joy	Brown	(108)365-8976	CSC
456328	Lisa	Williams	(239)879-3723	ENG
732489	Cathy	Cheng	(213)895-4367	MUS
null	zelalem	zergaw	(706)689-6985	CSC
NONE				

COURSE

C_CODE	CRS_NAME	CRDT	QUALIFIED_FACULTY
PHY304	Relativity	3	Wolfe, Lathrope, Macy
CHM208	Organic Chemistry	4	Walker, Bosch
CHM209	Physical Chemistry	4	Walker, Shara
MUS338	Jazz Ensemble	3	Gross
CSC121	Programming	3	LeMack, Kurup, Naik
ENG345	Creative Writing	3	Hanna, Cooley
CSC122	Organization	3	LeMack, Kurup
CSC124	Architecture	3	Kurup, Naik, Ray
PHY207	Dynamics	4	Wolfe, Lathrope, Levy
null	Database	4	Walker, Shara
NONE			

GRADE

CRS_NAME	SL_NAME	GRADE	FACULTY
Creative Writing	Cheng	B	Cooley
Dynamics	Brown	C	Lathrope
Dynamics	Smith	D	Wolfe
Programming	Brown	C	Kurup
Relativity	Cheng	A	Wolfe
Relativity	Meek	B	Wolfe
Jazz Ensemble	Williams	A	Gross
Organic Chemistry	Williams	C	Walker
NONE			
Software engineering	Williams	A	Michael

2. (1) Find union, intersection and difference of the following two relations.
Further, find **∏A,C (σ(A=a2) ^ (B=b2)(R)).**

R

A	B	C
a1	b1	c1
a1	b1	c2
a2	b2	c1
a2	b1	c2

S

A	B	C
a1	b2	c2
a2	b2	c1
a1	b1	c2

ANS:

Union R ∪ S

A	B	C
a1	b1	c1
a1	b1	c2
a2	b2	c1
a2	b1	c2
a1	b2	c2

Intersection R ∩ S

A	B	C
a1	b1	c2
a2	b2	c1

Difference R – S

A	B	C
a1	b1	c1
a2	b1	c2

∏A, C (σ(A=a2) ^ (B=b2)(R)).

A	C
a2	c1

3.(1) Find equi-join, natural join, left outer join and right outer join.

R

A	B	C
a1	b1	c1
a2	b1	c2
a3	b2	c1
a4	b1	c3

S

D	C	E
d1	c1	e2
d2		e3
d3	c2	e2
d4	c2	e1

ANS:

R ⋈R.c=S.c S (equi-join)

A	B	R.C	D	S.C	E
a1	b1	c1	d1	c1	e2
a2	b1	c2	d3	c2	e2
a2	b1	c2	d4	c2	e1
a3	b2	c1	d1	c1	e2

R ⋈ S (Natural-join)

A	B	C	D	E
a1	b1	c1	d1	e2
a2	b1	c2	d3	e2
a2	b1	c2	d4	e1
a3	b2	c1	d1	e2

R ⟖ S (Left -outer join)

A	B	C	D	E
a1	b1	c1	d1	e2
a2	b1	c2	d3	e2
a2	b1	c2	d4	e1
a3	b2	c1	d1	e2
a4	b1	c3	Null	null

R ⟕ S (right -outer join)

A	B	C	D	E
a1	b1	c1	d1	e2
a2	b1	c2	d3	e2
a2	b1	c2	d4	e1
Null	Null		d2	e3

4.(1.5) A relational database contains details about journeys from Chicago to a variety of destinations and contains the following relations:

Operator (opCode, opName)

Journey (opCode, destCode, price)

Destination (destCode, destName, distance)

- ✓ Each operator is assigned a unique code (opCode) and the relation Operator records the association between this code and the Operator's name (opName).
- ✓ Each destination has a unique code (destCode) and the relation Destination records the association between this code and the destination name (destName), and the distance of the destination from Chicago.
- ✓ The relation Journey records the price of an adult fare from Chicago to the given destination by a specified operator; several operators may operate over the same route.

ANS:

1.Find the names of all destinations within 20 miles.

$$\Pi_{destName} (\sigma_{distance \le 20} (Destination))$$

2.List the names of all operators with at least one journey priced at under $5.

$$\Pi_{opName} (Operator \bowtie_{price<5} (Jorney))$$

3. List the names of all operators and prices of journeys to 'Boston'.

$$\Pi_{opName,price}(\sigma_{destName='Boston'} ((Operator \bowtie_{operator.OpCode=Journey.opCode} Journey)) \bowtie_{Journey.destCode=Destination.destCode} (Destination)))$$

5.[1.5] Describe in English the relations that would be produced by the following relational algebra operations.

a. $\sigma_{Hotel.hotelNo = Room.hotelNo}(Hotel \times Room)$

List all Hotel Rooms with their Hotel information

b. $\Pi_{hotelName} (Hotel \bowtie_{Hotel.hotelNo = Room.hotelNo} (\sigma_{price > 50} (Room)))$

List all hotel names which has rooms with price greater than $50.

c. $Guest \rtimes (\sigma_{dateTo \ge \text{'1-Jan-2016'}} (Booking))$

Select all Guests who booked before or at jan first of 2016.