CS 338 – Winter 2014
Assignment #4
(Solutions will be posted on April 1st)

Question 1.

Consider a PART Schema as given below (same as the one in TPC-H database of Assignment 2) and a database instance of it.

p_partkey	p_name	p_mfgr	p_brand	p_type	p_size	p_container	p_retailprice	p_comment
1	goldenrod lace spring chartreuse ivory	Manufacturer#1	Brand#13	PROMO BURNISHED COPPER	7	JUMBO PKG	901	zMg1PACmQ 7RCCC7
2	snow ghost azure burnished lemon	Manufacturer#1	Brand#13	PROMO BURNISHED COPPER	1	LG CASE	902	Bxg4RlO6051n7NjN zn
1	cornflower navajo salmon lemon orchid	Manufacturer#4	Brand#42	STANDARD POLISHED BRASS	21	WRAP CASE	903	4241RR3By
4	olive dim lemon light khaki	Manufacturer#3	Brand#34	SMALL PLATED BRASS	14	MED DRUM	904	z1n7znz6
5	lavender cornsilk linen seashell lemon	Manufacturer#3	Brand#32	STANDARD POLISHED TIN	15	SM PKG	905	gj4Lg5BhBk12iS
6	cornsilk beige chartreuse medium blue	Manufacturer#4	Brand#24	PROMO PLATED STEEL	4	MED BAG	906	yNjzS Njyh4mgLx Om
7	honeydew purple cream mint coral	Manufacturer#1	Brand#11	SMALL PLATED COPPER	45	SM BAG	907	PSNg0L
6	puff blush tomato papaya navy	Manufacturer#4	Brand#42	PROMO PLATED STEEL	41	LG DRUM	908	k042AL4y21N1yNPC77
9	burnished violet pink rose drab	Manufacturer#4	Brand#43	SMALL BURNISHED STEEL	12	WRAP CASE	908	37PLkwhgiAP0xCkxO
10	slate dark white lavender purple	Manufacturer#5	Brand#54	LARGE BURNISHED STEEL	44	LG CAN	910.01	wPP74M1Lwj1

On the above schema consider the following set of Functional Dependencies (FDs).

FD1: p_partkey → p_name
FD2: {p_mfgr, p_brand} → p_retailprice
FD3: p_partkey → {p_mfgr, p_type}

Find out the tuples from the above database instance that violate the given Functional Dependencies. Provide your answer in form of the pair of tuples and the Functional Dependency that they violate.

Question 2.
a)
Consider the following relation Schema:

R1: (PROJ-NO, MACHINE-NO, PROJ-NAME, TIME-SPENT-ON-PROJ)

And the following Functional Dependencies:

FD1: PROJ-NO → {MACHINE-NO, PROJ-NAME, TIME-SPENT-ON-PROJ}
FD2: {PROJ-NO, MACHINE-NO} → TIME-SPENT-ON-PROJ
FD3: PROJ-NO → MACHINE-NO

State if the above relation is in BCNF and if not, due to which Functional dependencies.

b)
Consider the following relation Schema:
R2: (PROJ-NO, PERSON-NO, MACHINE-NO, TIME-SPENT-ON-PROJ)

And the following Functional Dependencies:

FD1: {PROJ-NO, PERSON-NO} → {MACHINE-NO, TIME-SPENT-ON-PROJ}
FD2: {PROJ-NO, MACHINE-NO} → TIME-SPENT-ON-PROJ

State if the above relation is in BCNF and if not, due to which Functional dependencies.

c)
Consider the following relation Schema:
R3: (PROJ-NO, PERSON-NO, MACHINE-NO)

And the following Functional Dependencies:

FD1: {PROJ-NO, PERSON-NO} → MACHINE-NO
FD2: PROJ-NO → MACHINE-NO

State if the above relation is in BCNF and if not, due to which Functional dependencies.

Question 3.

Let T be a table created over relation R (create table T (column1 columnType, ...)).
Assume that initially Bob has all permissions on T (including permission to grant permissions to others), nobody else has permissions on T.

Now consider the sequence of commands executed by the specified users to grant and revoke permissions as shown in Table 1 :

Table 1

Order	Command	Executed by
1	Grant Select on T To Alice with Grant Option	Bob
2	Grant Select on T To Clara	Alice
3	Grant Select on T To Donald	Alice
4	Grant Select on T To Clara	Bob
5	Revoke Select on T From Alice	Bob

Question: After the execution of the sequence of commands in Table 1, which of Bob, Alice, Clara, Donald are authorized to execute each of the commands as shown in Table 2

Table 2

Command	Bob	Alice	Clara	Donald
SELECT X FROM T WHERE Y < 100				
UPDATE T SET Y = Y* 3				
SELECT A FROM T WHERE C = 10				
INSERT INTO T VALUES (value1, value2, value3,...)				
CREATE VIEW View1 AS SELECT * FROM T				

Question 4.

Consider four different transaction execution schedules (include read/write operations)

$H1 = r_1[x]\ r_1[y]\ w_1[y]\ r_2[y]\ r_2[x]\ w_2[y]\ w_2[x]\ r_2[z]$
$H2 = r_2[y]\ r_2[x]\ w_2[y]\ w_2[x]\ r_2[z]\ r_1[x]\ r_1[y]\ w_1[y]$
$H3 = r_2[y]\ w_2[x]\ r_1[x]\ r_1[z]\ r_3[z]\ w_1[z]\ w_3[z]\ r_1[y]\ r_2[y]$
$H4 = w_2[x]\ w_3[z]\ r_3[x]\ r_4[y]\ r_3[z]\ w_1[y]\ w_4[x]\ r_1[x]\ r_1[z]\ r_4[z]$

Answer the following questions:
1. List all pairs of operations in schedule H1 that conflict with each other.
2. List all pairs of operations in schedule H2 that conflict with each other.
3. Are H1 and H2 conflict equivalent and why (or why not)?
4. For H3:
   - Give the serialization graph.
   - Determine whether or not the schedule is serializable, and justify your answer.
   - If the schedule is serializable, specify a serial order of transaction execution to which it is equivalent.

5. Similarly for H4:
   - Give the serialization graph.
   - Determine whether or not the schedule is serializable, and justify your answer.
   - If the schedule is serializable, specify a serial order of transaction execution to which it is equivalent.