CS 143 Homework 4

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1. It is lossless since $A \to BC \to D \to E$, therefore $A \to DE$ so A is a key in the second decomposed table.

2. $A \to B, C \to A$.

3. If $sid \to (dept, cnum)$ and $(dept, cnum) \to sid$, we have a one-to-one relationship. If $sid \to (dept, cnum)$ and $(dept, cnum) \not\to sid$, we have a many-to-one relationship.

4. (a) Yes because $A \to B \to D$, then $A \to CD \to E$ so $A \to BCDE$.

   (b) Yes because $B \to D$ then $CD \to E$ and $E \to A$, so $BC \to ADE$.

5. No because F cannot be determined so we would need (A, F) as key, so all the funcitonal dependencies fail the BCNF conditions. It can be normalized into a set of relations as follows:
   $R_0(A, B, C) : A \to BC$
   $R_1(B, D) : B \to D$
   $R_2(C, E) : C \to E$
   $R_3(A, F) :$ (none)

6. (a) CHECK (weight>0 AND weight<= 5)

   (b) CREATE TRIGGER t
   AFTER INSERT ON Laptop
   REFERENCING NEW ROW AS n
   FOR EACH ROW
   WHEN (weight>0 AND weight<= 5)
   BEGIN
   UPDATE Laptop WHERE model=n.model SET weight=NULL
   END;

7. (a) CREATE TABLE Employee(eid INT, name VARCHAR(20), salary INT, PRIMARY KEY(eid));
   CREATE TABLE LeavingTime(eid INT, date DATE, time TIME, PRIMARY KEY(eid, date), FOREIGN KEY(eid) REFERENCES Employee(eid));

   (b) INSERT INTO LeavingTime(143, 04-01-2015, 16:00:00);

   (c) We will get an error since the same primary key (eid, date) of the second swipe already exists in the database.

   (d) DELETE FROM LeavingTime
   WHERE eid, date, time NOT IN (SELECT eid, date, MAX(time) FROM LeavingTime GROUP BY date, time);

8. $(1, 27), (1, 100), (1, 100)$