ISE 305 DATABASE SYSTEMS   MIDTERM EXAM #2

90 MINUTES   **April 21, 2006**

Name: _____

Number: _____

Signature: _____

1	2	3	4a	4b	5	6	7a	7b	8	Total
/15	/15	/10	/5	/5	/5	/10	/10	/10	/15	/100

1. Consider the following table. Give an example of update anomaly, an example of deletion anomaly, an example of insertion anomaly knowing that a product can have many suppliers and can have many other products as a substitute (i.e. a poduct can be replaced by its substitute). The purchase price can be determined by a supplier for a product while the sale price is for a given product regardless of the supplier. The quantity is for a given product, again regardless of the supplier.

ProductID	SupplierID	Substitute	Quantity	PurchasePrice	SalePrice
123	987	121	509	200	250
123	987	122	509	200	250
123	998	121	509	210	250
123	998	122	509	210	250
342	987	344	120	199	189
432	789	433	100	100	210

Update anomaly:

Delation anomaly:

Insertion anomaly:

2. Give a schema of a decomposition that avoids such anomalies. Draw the functional dependency diagrams for the resulting relations.

3. Write an SQL query to define a view over the relations in question 2 in order to obtain the relation in question 1.

4. Consider the following relation R(A,B,C,E,F,G,H), the candidate keys A, DE and DF, and the functional dependency E→F.

    (a) Does the functinal dependency violate BCNF? Justify your answer using only the properties and definition of BCNF.

    (b) Does the functinal dependency violate 3NF? Justify your answer using only the properties and definition of 3NF.

5. What is a transaction? Explain briefly.

6. Define these terms: atomicity, correctness, isolation, durability. Be brief, and be specific.

7. Suppose that a database initially contains that following relation, called `Item`:

ID	Class	Dept.	Quantity
I1	C1	D1	1
I2	C1	D2	2
I3	C2	D1	2

Two transaction Ta and Tb run against this database. Both transactions start at the same time. Transaction Ta performs the following two queries:

```
select sum(Quantity) from Item where Class = 'C1'
```
followed by
```
select sum(Quantity) from Item where Dept = 'D1'
```
Transaction *Tb* performs the following actions:
```
Update Item set Quantity = 4 where Clas = 'C1' and Dept = 'D1'
```
followed by
```
Insert into Item values ('ID4','C1','D1',10)
```

(a) Suppose that transaction *Ta* runs at the Read Uncommited SQL isolation level. What are the possible pair of values that might be returned by *Ta*'s two queries? For example, if you write (3,7) as part of your answer, you are claming that it is possible that the first query would return a sum of 3 and the second query would return a sum of 7. Be sure to list all pairs of values that might be return.

(b) Suppose instead that transaction *Ta* runs at the Read Commited SQL isolation level. What are the possible pair of values that might be returned by *Ta*'s two queries?

8. A company database needs to store information about employees (identified by *eno*, with *ename* and *esalary* as attributes), departments (identified by *dno*, with *dname* and *budget* as atributes), supervisors (identified by *sno*, with *sname* and *ssalary* as attributes), and projects (identified by *pno*, with *pname* and *pbudget* as attributes). The company has several departments. Each department has a supervisor and at least one employee. Employees must be assigned to at least one, but possibly more departments. At least one employee is assigned to a project. Design and draw an ER diagram that captures the information about the company. Be sure to indicate any key and participation constraint.