Homework I

1. Consider the table:

   STAFF_MEETING (EmployeeName, ProjectName, Date)

   The rows of this table record the fact that an employee from a particular project attended a meeting on the given date. Assume that a project meets at most once per day. Also, assume that only one employee represents a given project, but that employees can be assigned to multiple projects.

   A. State the functional dependencies.

   B. Transform this table into one or more tables in BCNF. State the primary keys, candidate keys, foreign keys, and referential integrity constraints.

   C. Is your design in part b an improvement over the original table? What advantages and disadvantages does it have?

2. Regional Labs is a company that conducts research and development work on a contract basis for other companies and organizations. The Figure below shows data that Regional Labs collects about projects and the employees assigned to them. This data is stored in a relation (table) named PROJECT:

PROJECT (ProjectID, EmployeeName, EmployeeSalary)

Sample Data for Regional Labs

ProjectID	EmployeeName	EmployeeSalary
100-A	Eric Jones	64,000.00
100-A	Donna Smith	70,000.00
100-B	Donna Smith	70,000.00
200-A	Eric Jones	64,000.00
200-B	Eric Jones	64,000.00
200-C	Eric Parks	58,000.00
200-C	Donna Smith	70,000.00
200-D	Eric Parks	58,000.00

A. Assuming that all functional dependencies are apparent in this data, which of the following are true?

1. ProjectID → EmployeeName

2. ProjectID → EmployeeSalary

3. (ProjectID, EmployeeName) → EmployeeSalary

4. EmployeeName → EmployeeSalary

5. EmployeeSalary → ProjectID

6. EmployeeSalary → (ProjectID, EmployeeName)

B. What is the primary key of PROJECT?

C. Are all the nonkey attributes (if any) dependent on the primary key?

D. In what normal form is PROJECT?

E. Describe two modification anomalies that affect PROJECT.

F. Is ProjectID a determinant? If so, based on which functional dependencies in part A?

G. Is EmployeeName a determinant? If so, based on which functional dependencies in part A?

H. Is (ProjectID, EmployeeName) a determinant? If so, based on which functional dependencies in part A?

I. Is EmployeeSalary a determinant? If so, based on which functional dependencies in part A?

J. Does this relation contain a transitive dependency? If so, what is it?

K. Redesign the relation to eliminate modification anomalies.

3. Examine the list of e-mail messages shown below. Using the structure and example data items in this list, do the following:

	From	Subject	Date ↓	Size
☐	WDA2259@sailmail.com	Big Wind	5/13/2011	3 KB
☐	WDA2259@sailmail.com	Update	5/12/2011	4 KB
☐	WDA2259@sailmail.com	Re: Saturday Am	5/11/2011	4 KB
☐	WDA2259@sailmail.com	Re: Weather window!	5/10/2011	4 KB
☐	WDA2259@sailmail.com	Re: Howdy!	5/10/2011	3 KB
☐	WDA2259@sailmail.com	Still here	5/9/2011	3 KB
☐	WDA2259@sailmail.com	Re: Turle Bay	5/8/2011	4 KB
☐	WDA2259@sailmail.com	Turle Bay	5/8/2011	4 KB
☐	WDA2259@sailmail.com	Re: Hi	5/6/2011	3 KB
☐	WDA2259@sailmail.com	Sunday, Santa Maria	5/5/2011	3 KB
☐	Ki6yu@aol.com	Cabo, Thurs. Noon	5/2/2011	2 KB
☐	WDA2259@sailmail.com	turbo	5/1/2011	3 KB
☐	WDA2259@sailmail.com	on our way	4/28/2011	3 KB
☐	Tom Cooper	RE: Hola!	4/26/2011	3 KB
☐	Tom Cooper	RE: Hola!	4/24/2011	2 KB
☐	Tom Cooper	RE: Hola!	4/23/2011	3 KB

E-mail List

A   Create a single-entity data model for this list. Specify the identifier and all entities.

B   Modify your answer to A to include entities SENDER and SUBJECT. Specify the identifiers and attributes of entities and the type and cardinalities of the relationships. Explain which cardinalities can be inferred from the Figure above and which need to be checked out with users.

C   The e-mail address in the From column in the above Figure is in two different styles. One style has the true e-mail address; the second style (e.g., Tom Cooper) is the name of an entry in the user's e-mail directory. Create two categories of SENDER based on these two styles. Specify identifiers and attributes.

4. The figure below shows a listing of movie times at theaters in Seattle. Using the data in this figure as an example, do the following:

Movie

Lincoln

Daniel Day-Lewis, Sally Field, David Strathairn, and Tommy Lee Jones lead a stand-out cast in this historical drama.

Local Theaters and Showtimes

40 miles from the center of Seattle, WA Change Area
Tue, Jul 9 Wed Thu Fri Sat

Displaying 1 - 32 results, sorted by distance.

AMC Pacific Place 11 (0.5 miles)
600 Pine St, Seattle (206) 652-2404
Showtimes: 11:00 am, 12:00 pm, 12:45 pm, 1:30 pm, 2:30 pm, 3:15 pm, 4:00 pm, 5:00 pm, 5:45 pm, 6:30 pm, 7:30 pm, 8:30 pm, 9:00 pm, 10:00 pm, 10:45 pm

Neptune Theatre (3.9 miles)
1303 NE 45th, Seattle (206) 633-5545
Showtimes: 11:20 am, 1:30 pm, 3:40 pm, 5:50 pm, 8:00 pm, 10:10 pm

Regal Bellevue Galleria 11 (6.2 miles)
500 106th Ave NE, Bellevue (425) 451-7161
Showtimes: 11:00 am, 11:30 am, 1:00 pm, 1:30 pm, 3:00 pm, 3:30 pm, 5:05 pm, 5:35 pm, 7:10 pm, 7:40 pm, 9:20 pm, 9:50 pm

LCE Oak Tree Cinema (6.6 miles)
10006 Aurora Ave N., Seattle (206) 527-1748
Showtimes: 11:45 am, 2:15 pm, 4:45 pm, 7:15 pm, 9:45 pm

LCE Factoria Cinemas 8 (7.8 miles)
3505 Factoria Blvd SE, Bellevue (425) 641-9206
Showtimes: 12:00 pm, 1:00 pm, 2:15 pm, 3:15 pm, 4:30 pm, 5:45 pm, 7:30 pm, 8:15 pm, 9:45 pm, 10:30 pm

Kirkland Parkplace Cinema (8 miles)
404 Parkplace Ctr, Kirkland (425) 827-9000
Showtimes: 12:15 pm, 2:30 pm, 4:45 pm, 7:20 pm, 9:35 pm

Movie Time Listing

A   Create a model to represent this report using the entities MOVIE, THEATER, and SHOW_TIME. Assume that theaters may show multiple movies. Although this report is for a particular day, your data model should allow for movie times on different days as well. Specify the identifier of the entities and their attributes. Name the relationships and the type and cardinality of all relationships. Explain which cardinalities you can logically deduce and which need to be checked out with users. Assume that distance is an attribute of THEATER.

B   This report was prepared for a user who is located near downtown Seattle. Suppose that it is necessary to produce this same report for these theaters, but for a user located in a Seattle suburb such as Bellevue, Renton, Redmond, or Tacoma. In this case, distance cannot be an attribute of THEATER. Change your answer in A for this situation. Specify the entity identifiers and attributes. Name the relationships and identify the type and cardinality of all relationships.

C   Suppose that you want to make this data model national. Change your answer to B so that it can be used for other metropolitan areas. Change your answer in A for this situation. Specify the entity identifiers and attributes. Name the relationships and identify the type and cardinality of all relationships.

D   Modify your answer to C to include the leading cast members. Assume that the role of a cast member is not to be modeled. Specify the identifier of new entities and their attributes. Name the relationships and identify the type and cardinality of all relationships.

E   Modify your answer to C to include the leading cast members. Assume that the role of a cast member is specified. Specify the identifier of new entities and their attributes. Name the relationships and identify the type and cardinality of all relationships.

5. Design a database for your model in question 4(E) above. Your design should include a specification of tables and attributes as well as primary, candidate, and foreign keys. Also specify how you will enforce minimum cardinality. Document your minimum cardinality enforcement using referential integrity actions for required parents, if any, and t for required children, if any.

6. Consider the table:

   STAFF_MEETING (EmployeeName, ProjectName, Date)

   The rows of this table record the fact that an employee from a particular project attended a meeting on the given date. Assume that a project meets at most once per day. Also, assume that only one employee represents a given project, but that employees can be assigned to multiple projects.

   A. State the functional dependencies.

   B. Transform this table into one or more tables in BCNF. State the primary keys, candidate keys, foreign keys, and referential integrity constraints.

   C. Is your design in part b an improvement over the original table? What advantages and disadvantages does it have?

7. The Queen Anne Curiosity Shop is an upscale home furnishings store in a well-to-do urban neighborhood. It sells both antiques and current-production household items that complement or are useful with the antiques. For example, the store sells antique dining room tables and new tablecloths. The antiques are purchased from both individuals and wholesalers, and the new items are purchased from distributors. The store's customers include individuals, owners of bed-and-breakfast operations, and local interior designers who work with both individuals and small businesses. The antiques are unique, though some multiple items, such as dining room chairs, may be available as a set (sets are never broken). The new items are not unique, and an item may be reordered if it is out of stock. New items are also available in various sizes and colors (for example, a particular style of tablecloth may be available in several sizes and in a variety of colors).

Assume that The Queen Anne Curiosity Shop designs a database with the following tables:

CUSTOMER (CustomerID, LastName, FirstName, Address, City, State, ZIP, Phone, Email)

ITEM (ItemID, ItemDescription, CompanyName, PurchaseDate, ItemCost, ItemPrice)

SALE (SaleID, CustomerID, SaleDate, SubTotal, Tax, Total)

SALE_ITEM (SaleID, SaleItemID, ItemID, ItemPrice)

The relationships are

CUSTOMER	1 —— M	SALE	1 —— M	SALE_ITEM	M —— 1	ITEM
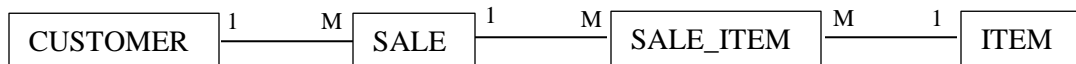
The referential integrity constraints are:

CustomerID in SALE must exist in CustomerID in CUSTOMER

SaleID in SALE_ITEM must exist in SaleID in SALE

ItemID in SALE_ITEM must exist in ItemID in ITEM

Assume that CustomerID of CUSTOMER, ItemID of ITEM, SaleID of SALE, and SaleItemID of SALE_ITEM are all surrogate keys with values as follows:

CustomerID Start at 1 Increment by 1

ItemID Start at 1 Increment by 1

SaleID Start at 1 Increment by 1

The column characteristics for the tables are shown below. The relationships CUSTOMER-to-SALE and ITEM-to-SALE_ITEM should enforce referential integrity, but not cascade updates nor deletions, while the relationship between SALE and SALE_ITEM should enforce referential integrity and cascade both updates and deletions. The data for these tables are shown below.

CUSTOMER

Column Name	Type	Key	Required	Remarks
CustomerID	AutoNumber	Primary Key	Yes	Surrogate Key
LastName	Text (25)	No	Yes	
FirstName	Text (25)	No	Yes	
Address	Text (35)	No	No	
City	Text (35)	No	No	
State	Text (2)	No	No	
ZIP	Text (10)	No	No	
Phone	Text (12)	No	Yes	
Email	Text (100)	No	Yes	

Column Characteristics for the QACS Database CUSTOMER Table

SALE

Column Name	Type	Key	Required	Remarks
SaleID	AutoNumber	Primary Key	Yes	Surrogate Key
CustomerID	Number	Foreign Key	Yes	Long Integer
SaleDate	Date	No	Yes	
SubTotal	Number	No	No	Currency, 2 decimal places
Tax	Number	No	No	Currency, 2 decimal places
Total	Number	No	No	Currency, 2 decimal places

Column Characteristics for the QACS Database SALE Table

SALE_ITEM

Column Name	Type	Key	Required	Remarks
SaleID	Number	Primary Key, Foreign Key	Yes	Long Integer
SaleItemID	Number	Primary Key	Yes	Long Integer
ItemID	Number	Number	Yes	Long Integer
ItemPrice	Number	No	No	Currency, 2 decimal places

Column Characteristics for the QACS Database SALE_ITEM Table

ITEM

Column Name	Type	Key	Required	Remarks
ItemID	AutoNumber	Primary Key	Yes	Surrogate Key
ItemDescription	Text (255)	No	Yes	
CompanyName	Text (100)	No	Yes	
PurchaseDate	Date	No	Yes	
ItemCost	Number	No	Yes	Currency, 2 decimal places
ItemPrice	Number	No	Yes	Currency, 2 decimal places

Column Characteristics for the QACS Database ITEM Table

CustomerID	LastName	FirstName	Address	City	State	ZIP	Phone	Email
1	Shire	Robert	6225 Evanston Ave N	Seattle	WA	98103	206-524-2433	Rober.Shire@somewhere.com
2	Goodyear	Katherine	7335 11th Ave NE	Seattle	WA	98105	206-524-3544	Katherine.Goodyear@somewhere.com
3	Bancroft	Chris	12605 NE 6th Street	Bellevue	WA	98005	425-635-9788	Chris.Bancroft@somewhere.com
4	Griffith	John	335 Aloha Street	Seattle	WA	98109	206-524-4655	John.Griffith@somewhere.com
5	Tierney	Doris	14510 NE 4th Street	Bellevue	WA	98005	425-635-8677	Doris.Tierney@somewhere.com
6	Anderson	Donna	1410 Hillcrest Parkway	Mt. Vernon	WA	98273	360-538-7566	Donna.Anderson@elsewhere.com
7	Svane	Jack	3211 42nd Street	Seattle	WA	98115	206-524-5766	Jack.Svane@somewhere.com
8	Walsh	Denesha	6712 24th Avenue NE	Redmond	WA	98053	425-635-7566	Denesha.Walsh@somewhere.com
9	Enquist	Craig	534 15th Street	Bellingham	WA	98225	360-538-6455	Craig.Enquist@elsewhere.com
10	Anderson	Rose	6823 17th Ave NE	Seattle	WA	98105	206-524-6877	Rose.Anderson@elsewhere.com

Sample Data for the QACS Database CUSTOMER Table

SaleID	CustomerID	SaleDate	SubTotal	Tax	Total
1	1	12/14/2012	$3,500.00	$290.50	$3,790.50
2	2	12/15/2012	$1,000.00	$83.00	$1,083.00
3	3	12/15/2012	$50.00	$4.15	$54.15
4	4	12/23/2012	$45.00	$3.74	$48.74
5	1	1/5/2013	$250.00	$20.75	$270.75
6	5	1/10/2013	$750.00	$62.25	$812.25
7	6	1/12/2013	$250.00	$20.75	$270.75
8	2	1/15/2013	$3,000.00	$249.00	$3,249.00
9	5	1/25/2013	$350.00	$29.05	$379.05
10	7	2/4/2013	$14,250.00	$1,182.75	$15,432.75
11	8	2/4/2013	$250.00	$20.75	$270.75
12	5	2/7/2013	$50.00	$4.15	$54.15
13	9	2/7/2013	$4,500.00	$373.50	$4,873.50
14	10	2/11/2013	$3,675.00	$305.03	$3,980.03
15	2	2/11/2013	$800.00	$66.40	$866.40

Sample Data for the QACS Database SALE Table

SaleID	SaleItemID	ItemID	ItemPrice
1	1	1	$3,000.00
1	2	2	$500.00
2	1	3	$1,000.00
3	1	4	$50.00
4	1	5	$45.00
5	1	6	$250.00
6	1	7	$750.00
7	1	8	$250.00
8	1	9	$1,250.00
8	2	10	$1,750.00
9	1	11	$350.00
10	1	19	$5,000.00
10	2	21	$8,500.00
10	3	22	$750.00
11	1	17	$250.00
12	1	24	$50.00
13	1	20	$4,500.00
14	1	12	$3,200.00
14	2	14	$475.00
15	1	23	$800.00

Sample Data for the QACS Database SALE_ITEM Table

ItemID	ItemDescription	CompanyName	PurchaseDate	ItemCost	ItemPrice
1	Antique Desk	European Specialties	11/7/2012	$1,800.00	$3,000.00
2	Antique Desk Chair	Andrew Lee	11/10/2012	$300.00	$500.00
3	Dining Table Linens	Linens and Things	11/14/2012	$600.00	$1,000.00
4	Candles	Linens and Things	11/14/2012	$30.00	$50.00
5	Candles	Linens and Things	11/14/2012	$27.00	$45.00
6	Desk Lamp	Lamps and Lighting	11/14/2012	$150.00	$250.00
7	Dining Table Linens	Linens and Things	11/14/2012	$450.00	$750.00
8	Book Shelf	Denise Harrion	11/21/2012	$150.00	$250.00
9	Antique Chair	New York Brokerage	11/21/2012	$750.00	$1,250.00
10	Antique Chair	New York Brokerage	11/21/2012	$1,050.00	$1,750.00
11	Antique Candle Holder	European Specialties	11/28/2012	$210.00	$350.00
12	Antique Desk	European Specialties	1/5/2013	$1,920.00	$3,200.00
13	Antique Desk	European Specialties	1/5/2013	$2,100.00	$3,500.00
14	Antique Desk Chair	Specialty Antiques	1/6/2013	$285.00	$475.00
15	Antique Desk Chair	Specialty Antiques	1/6/2013	$339.00	$565.00
16	Desk Lamp	General Antiques	1/6/2013	$150.00	$250.00
17	Desk Lamp	General Antiques	1/6/2013	$150.00	$250.00
18	Desk Lamp	Lamps and Lighting	1/6/2013	$144.00	$240.00
19	Antique Dining Table	Denesha Walsh	1/10/2013	$3,000.00	$5,000.00
20	Antique Sideboard	Chris Bancroft	1/11/2013	$2,700.00	$4,500.00
21	Dining Table Chairs	Specialty Antiques	1/11/2013	$5,100.00	$8,500.00
22	Dining Table Linens	Linens and Things	1/12/2013	$450.00	$750.00
23	Dining Table Linens	Linens and Things	1/12/2013	$480.00	$800.00
24	Candles	Linens and Things	1/17/2013	$30.00	$50.00
25	Candles	Linens and Things	1/17/2013	$36.00	$60.00

Sample Data for the QACS Database ITEM Table

Write SQL statements and show the results based on the QACS data for each of the following:

A. Show all data in the CUSTOMER table

B. List the LastName, FirstName, and Phone of all customers.

C. List the LastName, FirstName, and Phone for all customers with a FirstName of 'John'.

D. List the LastName, FirstName, and Phone of all customers whose first name starts with 'D'.

E. Determine the maximum and minimum sales Total.

F. Determine the average sales Total.

G. Count the number of customers.

H. Group customers by LastName and then by FirstName.

I. Count the number of customers having each combination of LastName and FirstName.

J. Show the LastName, FirstName, and Phone of all customers who have had an order with Total greater than $100.00. Use a subquery. Present the results sorted by LastName in ascending order and then FirstName in descending order.

K. Show the LastName, FirstName, and Phone of all customers who who have bought an Item named 'Desk Lamp'. Use a subquery. Present results sorted by LastName in ascending order and then FirstName in descending order.

L. Show the LastName, FirstName, and Phone of all customers who have bought an Item named 'Desk Lamp'. Use a combination of a join and a subquery that is different from the combination used for question S. Present results sorted by LastName in ascending order and then FirstName in descending order.

Deadline: Wednesday, April 20

Submit at D2L