4) Create 10 true or false questions with solution from any topic covered in this class:

1. The SELECT command, with its various clauses, allows users to query the data contained in the tables.
   a) **TRUE**
   b) FALSE

2. A Semicolon at the end of each SQL statement is used to terminate the statement
   a) **TRUE**
   b) FALSE

3. E.F. Codd created the concept of the relational database
   a) **TRUE**
   b) FALSE

4. A SELECT statement within another SELECT statement and enclosed in square brackets ([...]) is called a subquery
   a) TRUE
   b) **FALSE**

5. SELECT DISTINCT is used if a user wishes to see duplicate columns in a query
   a) TRUE
   b) **FALSE**

6. A multiple row subquery returns more than one row from the inner SELECT statement
   a) **TRUE**
   b) FALSE

7. COUNT(*) returns the number of columns in a table
   a) TRUE
   b) **FALSE**

8. The DELETE statement is used to delete a table from the database
   a) TRUE
   b) **FALSE**

9. DDL/DCL statements are automatically committed
   a) **TRUE**
   b) FALSE

10. A weak entity can exist without another entity
    a) TRUE
    b) **FALSE**

5) Create 10 multiple choice questions including solution covering queries, subqueries, trigger, stored procedures, math functions, backup, privilege and any other topics covered in the class

1. SQL stands for _____.
   a) None of these
   b) Simple Query Language
   c) Standard Query Language
   d) Structured Query Language

2. The _____ clause is used to list the attributes desired in the result of a query.
   a) Where
   b) Select
   c) From
   d) Distinct

3. A Trigger is a special type of _____.
   a) Function
   b) View
   c) Stored Procedure
   d) Table

4. Backup can only occur while the database is in _____ state.
   a) Online
   b) Offline
   c) Restoring
   d) All of the above

5. Which of the following is used to provide privilege to only a particular attribute?
   a) Grant select on employee to Amit
   b) Grant update(budget) on department to Raj
   c) Grant update(budget, salary, Rate) on department to Raj
   d) Grant delete to Amit

6. Point out the correct statement.
   a) Stored procedures assist in achieving a consistent implementation of logic across applications.
   b) A stored procedure is a group of Transact-SQL statements compiled into a single execution plan.
   c) Stored procedures can also improve performance.
   d) All of the above

7. Which of the following is used to refer to a particular record in your database?
   a) Relation
   b) Instance
   c) Table
   d) Column
8. A UNION query is which of the following?
   a) Combines the output from no more than two queries and must include the same number of columns.
   b) Combines the output from no more than two queries and does not include the same number of columns.

c) **Combines the output from multiple queries and must include the same number of columns.**

d) Combines the output from multiple queries and does not include the same number of columns.

9. The acronym ACID stands for which of the following?
   a) Atomicity, Complexity, Isolation, Durability
   b) Argumentative, Consistency, Isolation, Durability
   c) **Atomicity, Consistency, Isolation, Durability**
   d) Atomicity, Consistency, Isolation, Dependability

10. Suppose the relation R (A, B, C, D) has the following functional dependencies:

   A -> B
   B -> C
   BC -> A
   A -> D
   E -> A
   D -> E

   Which of the following is not a key?
   a) A
   b) E
   c) **B, C**
   d) D

6) Create 3 questions including solution and associated diagrams that cover normalization from 1NF, 2NF, 3NF and BCNF:

1. Normalize the following schema up to 3NF and discuss every step with clear explanation:

DonationID	DonorID	Donor	Date	Amount	ProjectID
1	1	Marco Pinelli	13Dec2002	$200	1
2	2	Victor Gomez	15Dec2002	$100	2
3	2	Victor Gomez	15Dec2002	$100	3
4	2	Victor Gomez	15Dec2002	$50	4
5	3	Seung Young Lee	16Dec2002	$150	4

Solution

First Normal Form:

With 1NF, we are trying to remove repeating groups of data. A repeating group has a primary key with a domain or set of domains, directly relating to the same key. In this question with DonorID as the primary key, we see two domains Donor and Date repeat themselves across the tuples for each of the different Amount and ProjectID entries.

DonorID	Donor	Date
1	Macro Pinelli	13Dec2002
2	Victor Gomez	15Dec2002
3	Seung Young Lee	16Dec2002

DonorId	DonationID	Amount	ProjectID
1	1	$200	1
2	2	$100	2
2	3	$100	3
2	4	$50	4
3	5	$150	4

Second Normal Form:

We know we don't have any repeating groups as we removed these with First Normal Form. But if we look at our question, we can see that Amount and ProjectID repeats. The 2NF has two tables, one Normalized and another un-normalized. The un-normalized table comprises of a composite key and the other table has DonationID, Amount and ProjectID. Because Amount and ProjectID depend on DonationID. Here, DonationID is a prime attribute, whereas Amount and ProjectID are non-prime attributes.

DonorID	DonationID
1	1
2	2
2	3
2	4
3	5

DonationID	Amount	ProjectID
1	$200	1
2	$100	2
3	$100	3
4	$50	4
5	$150	4

Third Normal Form:

We have the second un-normalized table which consists of DonationID as the primary key and Amount and ProjectID that depends on DonationID. So, DonationID and Amount make a new relation, and DonationID and ProjectID make a new relation. **The new tables are now in 3NF and are Normalized as they can't be decomposed any further.**

DonationID	Amount
1	$200
2	$100
3	$100
4	$50
5	$150

DonationID	ProjectID
1	1
2	2
3	3
4	4
5	4

2. **Produce the Third Normal Form of the given Order form by applying the process of Normalization:**

```
                            Order Form

    Order number:      1234              Date:      11/04/98

    Customer number:  9876

    Customer name:    Billy

    Customer address: 456 HighTower Street

    City-Country:      Hong Kong, China


   ProductNo        Desscription         Quantity      Unit Price

     A123           Pencil                100           $3.00

     B234           Eraser                200           $1.50

     C345           Sharpener             5             $8.00
```

Solution

UNF

ORDER[order#, customer#, name, address, date(product#, description, quantity, unitprice)]

1NF

ORDER(order#, customer#, name, address, date)
ORDER_LINE(order#, product#, description, quantity, unitprice)

2NF

ORDER(order#, customer#, name, address, date)
ORDER_LINE(order#, product#, quantity)
PRODUCT(product#, description, unitprice)

3NF

ORDER(order#, customer#, date)
CUSTOMER(customer#, name, address)
ORDER_LINE(order#, product#, quantity)
PRODUCT(product#, description, unitprice)

3. **Normalize the given database from UNF (Unnormalized Normal Form) to the optimal Normal form:**

Gallery Customer History Form

Customer Name

Jackson, Elizabeth   Phone (206) 284-6783
123 – 4th Avenue
Fonthill, ON
L3J 4S4

Purchases Made

Artist	Title	Purchase Date	Sales Price
03 - Carol Channing	Laugh with Teeth	09/17/2000	7000.00
15 - Dennis Frings	South toward Emerald Sea	05/11/2000	1800.00
03 - Carol Channing	At the Movies	02/14/2002	5550.00
15 - Dennis Frings	South toward Emerald Sea	07/15/2003	2200.00

The Gill Art Gallery wishes to maintain data on their customers, artists and paintings. They may have several paintings by each artist in the gallery at one time. Paintings may be bought and sold several times. In other words, the gallery may sell a painting, then buy it back at a later date and sell it to another customer.

Solution

UNF

CUSTOMER [custno, cust_name, cust_addr, cust_phone, (artist_id, artist_name, art_title, pur_date, price)]

1NF

CUSTOMER (custno, cust_name, cust_addr, cust_phone)
CUST_ART (custno, art_code, pur_date, artist_id, artist_name, art_title, price)

NOTE: The key chosen for the repeating group is the piece of art itself (a code was assigned), however because a piece of art may be bought by a customer more than once, the purchase date was added as part of the key to make the rows unique.

2NF

CUSTOMER (custno, cust_name, cust_addr, cust_phone)
CUST_ART (custno, art_code, pur_date, price)
ART (art_code, art_title, artist_id, artist_name)

3NF

CUSTOMER (custno, cust_name, cust_street, cust_city, cust_prov, cust_pstlcd, cust_phone)
CUST_ART (custno, art_code, pur_date, price)
ART (art_code, art_title, artist_id(FK))
ARTIST (artist_id, artist_fname, artist_lname)

7) Create 2 questions including solution and associated diagrams that cover ERD and EERD concept:

1. **A pet store currently uses a legacy flat file system to store all of its information. The owner of the store, Peter Corona, wants to implement a Web-enabled database application. This would enable branch stores to enter data regarding inventory levels, ordering, and so on. Presently, the data for inventory and sales tracking are stored in one file that has the following format:**

StoreName, PetName, PetDescription, Price, Cost,
SupplierName, ShippingTime, QuantityOnHand,
DateOfLastDelivery, DateOfLastPurchase,
DeliveryDate1, DeliveryDate2, DeliveryDate3,
DeliveryDate4, PurchaseDate1, PurchaseDate2,
PurchaseDate3, PurchaseDate4,
LastCustomerName, CustomerName1,
CustomerName2, CustomerName3,
CustomerName4

Draw an ERD based on the assumptions that you want to track all purchase and inventory data, such as who bought the fish, the date that it was purchased, the date that it was delivered, and so on. The present file format allows only the tracking of the last purchase and delivery as well as four prior purchases and deliveries. You can assume that a type of fish is supplied by one supplier.
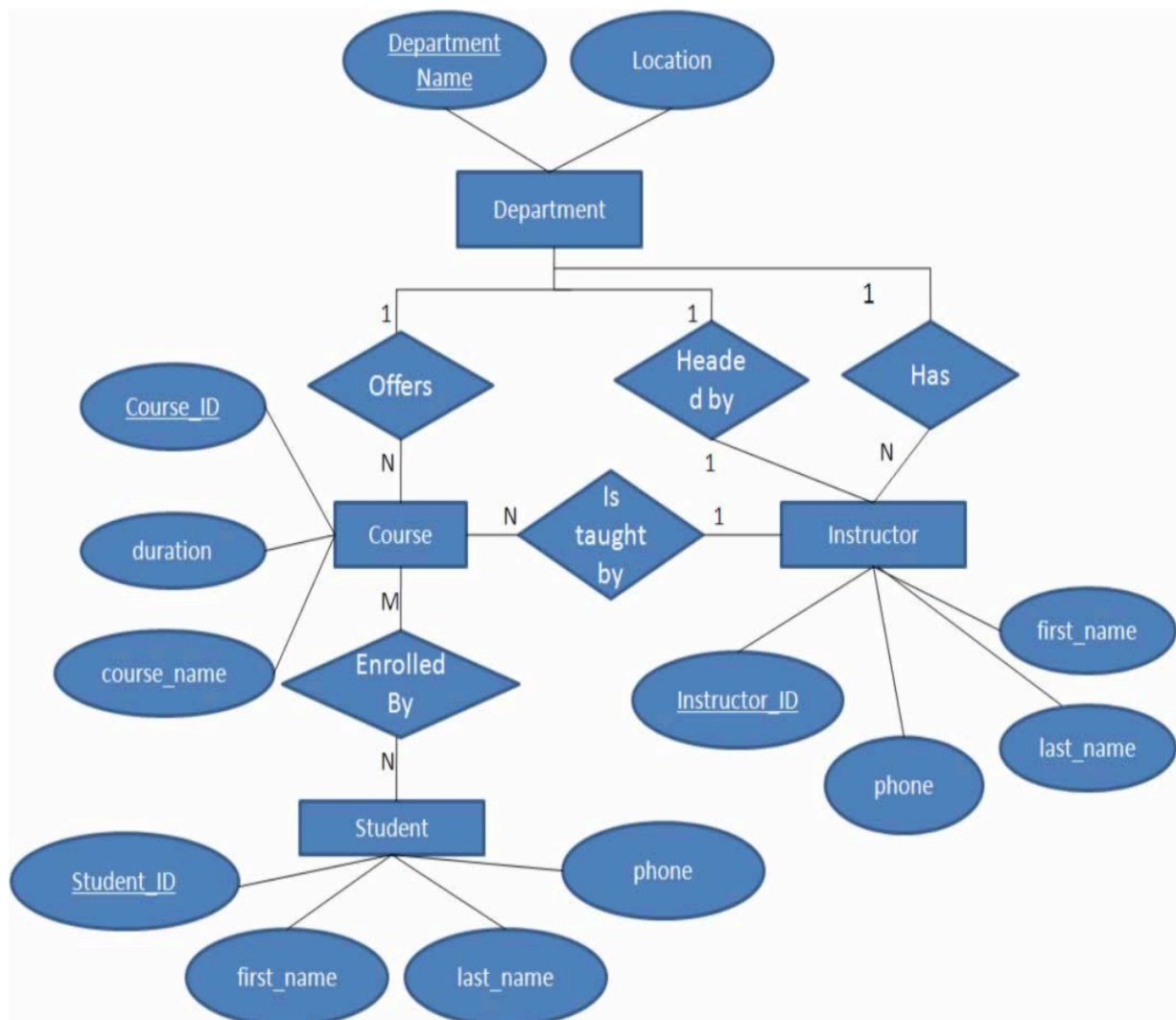
Solution:
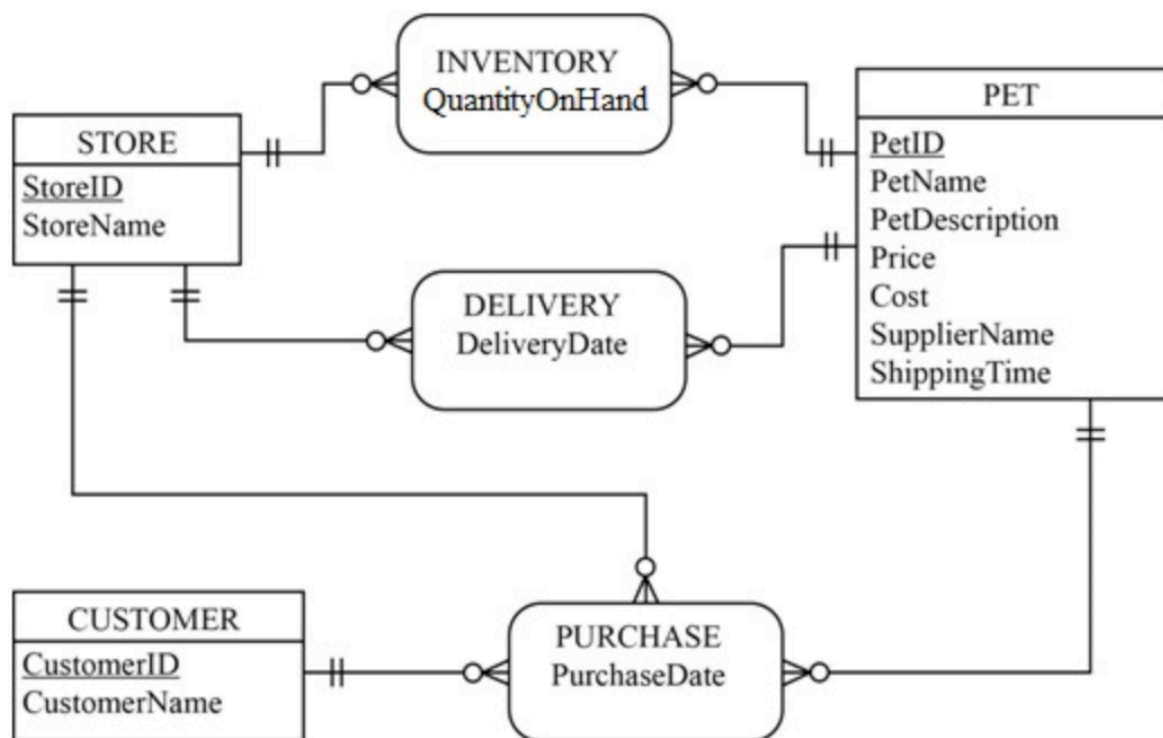
2. Create a well-defined Entity Relationship Diagram (ERD) for a college database based on the following statements:

- A college contains many departments
- Each department can offer any number of courses
- Many instructors can work in a department
- An instructor can work only in one department
- For each department there is a Head
- An instructor can be head of only one department
- Each instructor can take any number of courses
- A course can be taken by only one instructor
- A student can enroll for any number of courses
- Each course can have any number of students

Solution:

8) Create 5 questions including solution and code covering the SQL coding skills and concept:

Considering the schema given below for a company database and answer the following questions:

```sql
CREATE DATABASE ORG;
SHOW DATABASES;
USE ORG;

CREATE TABLE Worker (
        WORKER_ID INT NOT NULL PRIMARY KEY AUTO_INCREMENT,
        FIRST_NAME CHAR(25),
        LAST_NAME CHAR(25),
        SALARY INT(15),
        JOINING_DATE DATETIME,
        DEPARTMENT CHAR(25)
);

CREATE TABLE Bonus (
        WORKER_REF_ID INT,
        BONUS_AMOUNT INT(10),
        BONUS_DATE DATETIME,
        FOREIGN KEY (WORKER_REF_ID)
              REFERENCES Worker(WORKER_ID)
         ON DELETE CASCADE
);

CREATE TABLE Title (
        WORKER_REF_ID INT,
        WORKER_TITLE CHAR(25),
        AFFECTED_FROM DATETIME,
        FOREIGN KEY (WORKER_REF_ID)
              REFERENCES Worker(WORKER_ID)
        ON DELETE CASCADE
);
```

1. Write an SQL query to print the first three characters of FIRST_NAME from worker table.

    Solution:

    SELECT substring (FIRST_NAME, 1, 3) FROM Worker;

2. Write an SQL query to fetch the worker names with Salaries >= 50000 and <= 100000.

   Solution:

   ```
   SELECT CONCAT (FIRST_NAME, ' ', LAST_NAME) AS Worker_Name, Salary
   FROM Worker
   WHERE WORKER_ID IN
   (SELECT WORKER_ID FROM Worker
   WHERE Salary BETWEEN 50000 AND 100000);
   ```

3. Write an SQL query to fetch the Departments that have less than five people in it.

   Solution:

   ```
   SELECT DEPARTMENT, COUNT(WORKER_ID) AS 'Number of Workers' FROM Worker
   GROUP BY DEPARTMENT
   HAVING COUNT(WORKER_ID) < 5;
   ```

4. Write an SQL query to print the name of employees having the highest salary in each department.

   Solution:

   ```
   SELECT t.DEPARTMENT, t.FIRST_NAME, t.Salary FROM (SELECT max(Salary)
   AS TotalSalary, DEPARTMENT FROM Worker GROUP BY DEPARTMENT) AS TempNew
   INNER JOIN Worker t ON TempNew.DEPARTMENT = t.DEPARTMENT
   AND TempNew.TotalSalary=t.Salary;
   ```

5. Write an SQL query to fetch the list of all employees having the same salary.

   Solution:

   ```
   SELECT DISTINCT W.WORKER_ID, W.FIRST_NAME, W.Salary
   FROM Worker W, Worker W1
   WHERE W.Salary = W1.Salary
   AND W.WORKER_ID != W1.WORKER_ID;
   ```

9) Write a team evaluation (for each of your team members—2-3 sentences for each team member) including who do you think is the most valuable team member and why; Rank everyone on your team including yourself (1 is the best, 2 is 2nd best, etc.); what works best for your team and what did not? Rank all the team in class including your team.

TEAM EVALUATION (As per Rank):

1. **Christy Anoop Joseph:**
   Anoop was, in my opinion, the most valuable member in our team, and the member with the most coding skills. He was responsible for coding the rules and that was something that proved hard to do. His knowledge of SQL & JAVA scripts is second to none.

2. **Faris Sumadi:**
   Being a full-time employee at an Asset Management firm, Faris was quick to come up with the idea of the project since he already had a brief idea about Insider trading detection in his company, and what value we could bring to the problem at hand. His dedication to the project was admirable as he was also studying for his CFA and made sure that every other free minute he had was put to use on the project.

3. **Ashwin Madhusudan:**
   I had some prior knowledge with insider trading and the stock markets when I networked and spent some time with the folks in the trading team at my co-op at MFS Investment Management, and I was able to use this knowledge to brainstorm the rule engine along with Faris. I was also instrumental in the data insertion/manipulation part of the project which turned out to be quite tricky, but I managed to get it done efficiently.

4. **Yuzhe Li:**
   Yuzhe was most helpful during the early stages of the project when we were formulating all the diagrams. He was instrumental in drawing up the USE case diagram and the Entity Relationship Diagram (ERD) using the draw.io tool. He also never missed a single meeting!

5. **Sindhu Raghavendra:**
   Sindhu had some prior experience in databases which was very useful to the team during the course of the project. Also a very dedicated member of the team, she made sure she provided a helping hand in all aspects of our project.

What worked best for our team was the fact that each of us were mostly from different educational backgrounds and we were able to leverage this by providing different solutions to tackle each problem since each of us looked at a problem with a slightly different perspective. The scheduling issues for meetings was most definitely the biggest issue with regard to our team since we had people who were working full-time and others including myself who worked long hours on-campus, so we had to make the most out of every time we arranged a project meeting.

TEAM RANKINGS:

1. Inspiration
2. Rebel
3. CK
4. Skyhawk
5. Blade
6. Vanguard
7. Ninja
8. Teal
9. Paws
10. Xlate
11. 5Gs

<u>10) If you are given an opportunity to be a paid TA or non-paid/volunteer in Spring or Summer 2019, would you be interested (Do include if you are interested in volunteer vs paid position?) If you are interested, what skillsets and quality would make you a successful TA or a part of the team?</u>

→ Although I would love the opportunity, this is my final semester as a graduate student here at Northeastern and will be seeking full-time opportunities soon after graduation. If any full-time opportunities did come up, I would really appreciate if I am considered at the time, or even if there were other people of significance that I could network and align with to help me with my job search. My focus is in the Supply Chain industry; however, I do have experience in Business Analysis through my co-op and previous internships. With a solid base in databases upon completion of this course, skills in Data manipulation and Visualization, a strong business acumen and picking up Python in the near future, I am confident of being an asset as a Business Analyst/Supply Chain professional.

REFERENCES

- https://www.chegg.com/homework-help/problem-exercise-21-draw-er-diagram-based-normalized-relatio-chapter-4-problem-51pe-solution-9780133544619-exc

- https://www.techbeamers.com/sql-query-questions-answers-for-practice/

- https://www.sanfoundry.com/sql-server-mcqs-stored-procedure-1/

- http://www.c4learn.com/mcq/database-mcq/sql-mcq-true-or-false-multiple-choice-questions/

- https://www.slideshare.net/BadrulAlam16/dbms-normalization-74468888?from_action=save

- http://www4.comp.polyu.edu.hk/~cstyng/data.98/tutorials/norm5.html

- https://cs.senecac.on.ca/~dbs201/pages/Normalization_Practice.htm

- http://www.careerbless.com/db/rdbms/c1/er2.php