CIDM 3350 Project: Database design and Implementation
Total Points: 150 (15% of the course's final grade)
- ### Due on : Monday, Apr 26, 11:59pm

Objective: Assess your understanding of database design process and applications

Skills needed: given a system description that uses a traditional file-based information system, and you make the best effort to create a more efficient database system for this business based on the given description. To Complete this project you need to know How to:

1- Identify the system requirements
2- Identify main system entities and their attributes
3- Identify the relationships between the entities and their cardinalities
4- Create and refine conceptual and logical models for the system
5- Translate Entities and relationships into Implementation
6- Use Keys concepts to implement relationships and enforce integrity constraints
7- Write MySQL Data Definition commands to build the database from the design
8- Write MySQL Commands to create system requested data views
9- Write MySQL SELECT queries to process the data and provide answers to questions of interest

Requirements & Submission:

1. You need to submit the following files:
   a) One PDF file contains your design (Detailed (logical) Crow's foot ERD) and your assumptions and justifications.
   b) One MySQL DDL script file to create the database and insert some data into the tables
   c) One MySQL DML script file contains queries to update data and answer the given questions about the data in task a and b
   d) One PDF file contains screenshots to show the output of DML queries in part c above
2. You **must** include **your name** (**group**) at the beginning of each file
3. Submit on WTClass ("Resources >> Project >> Project submission)

Introduction:

In this project, you will design and implement a database for car services company called *ZZcars* **to help them** manage their services.

With the growth in customers and the demand for a variety of different services, ZZcars manager feels their traditional Excel approach is no longer sufficient for managing the customer's car information and the various services they provide. So, they need a new system to help facilitate their ongoing operations and have reached out to you for a solution.

You will first design an ERD diagram for this company database application. Then, you will need to map the ERD into a relational database schema and implement it on MySQL DBMS. Finally, you will load some testing data into the database, and write some queries to retrieve /update information from/to the database.

The system description and requirements are given in the following section

System Description and requirements for ZZCars:

a) Introduction to ZZCars :
ZZCars is a company that provides different car services to its customers. The company keeps record of the contact information of its customers and information about their cars. When a customer brings his car to be serviced for the first time, the car information like its *make*, *model*, *year*, *VIN*, and *mileage* will be recorded. If a car has visited before and its information is already in the system, then some information may be updated, like *mileage*. Each time a car came in for service, a new service ticket contains description of the requested services is issued and dated with current date.
The company hire some mechanics who take care of the services, so it needs to keep track of the mechanics who worked on each provided service. The company also purchases car parts from multiple suppliers, so it keeps inventory of all parts, their prices, their quantities, and their suppliers.

b) current system :
The information currently is stored in Excel file, and described as follows:
- Each customer has a unique Id, and he may has one or more cars serviced at the company. The company keeps record of Customer's personal information like Name, Street Address, Postal Code, phone # and email associated with his cars.
- The company keeps records of its mechanics information like unique Id number, name and charge per hour.

- Each car has a VIN number that uniquely identifies it. A Car may be associated with one or more customers (because cars may be sold, and then brought in by the new owners), so the company needs to keep the association between the car and its most recent owner.

- When a Customer brings in his car for service on specific date, he gives description about the car's defects or the type of service he wants (like fix the breaks or change oil) to one of the associates who creates a service ticket for the car. Each service ticket has a unique Ticket ID, and a date. The ticket also contains information about the requested service, and each ticket is associated with only one car. That is, a car may be associated with many tickets, but a ticket must be associated with one and only one car.

- When the car is serviced, a service record is created for each single service provided (this means, each ticket may have one or more service records associated with it). Each service record contains information about one service, like the description of the provided service, the labor cost, and the cost of replaced parts. The labor cost is calculated based on the mechanic charge per hour and the number of hours worked by each mechanic (a service could be done by more than one mechanic), while the parts cost is calculated based on the number of parts used and the price of each part (i.e. a service may use 0 or more parts).

- Each service record is given a number, and the service record must be associated with one or more mechanics who worked on the service. Each mechanic's work time on each service must be recorded, which will be used to calculate the labor cost of the service. Also, each service could use zero or more parts from the inventory. If parts were used, the used quantity of each part must be recorded in the service record to be used to calculate the parts cost of the service.

- The Customer will be billed according to the total cost of all services associated with his car's ticket (so the bill is associated with one ticket, and each ticket has one bill). The cost of each service is the sum of its labor and parts costs. The labor cost of each service is calculated as the sum of charges of all mechanics who worked on the service. Each mechanic charge is calculated as the mechanic's *work hours* **multiplied by** his *charge per hour*. The parts cost of each service is calculated by sum of all used parts' cost. The cost of each used part is calculated by **multiplying** the *part price* by the *quantity* of used parts.

- Each ticket is billed on one Bill, which is identified by bill Number, and has the additional attributes bill date, total, and Amount Paid. The remaining balance of each bill can be calculated at any time as the difference between bill total and the amount paid.

Attached with this document a sample of Excel files from the current system, which you will use as input data to test your database and DML queries.

Task:

Your task is to design a database system for **ZZCars** to help them query their data with ease and avoid all possible update, insert, and redundancy issues in their current file-based system.

A) You first build an ERD for the database, then translate it to MySQL DDL to implement it.
  Task A Deliverables: 1- One PDF file contains detailed crow's foot ERD of the system
                              2- One MySQL DDL script file to create the database

B) To prove the usefulness of your database-based system, you should insert some data in your tables (use the data in the attached excel files), and run DML Queries to update and retrieve some information from the database.

B.1) Insert the given data from excel files into the tables

In this task, you need to upload the data from the attached excel files to your tables. Note that the structure of your tables could be different from the excel files (current system may have some redundancies and other issues you should avoid in your design). So you may create a new set of csv files from the excel files and then import them to your tables, or you may create an SQL script with insert into statements and use the data from the excel files.

Keep in mind that the attached data tables used in the file-based system are not normalized. Also, feel free to add other attribute(s) to any of the entities in your design if you think it serves a useful purpose.

After you implement your database and inserted the data from the sample excel files, write and run SQL queries to update the data (task B.2) and answer the questions in task B.3:

B.2) Update Queries: Write queries to

UQ1-Update customers data by adding a new customer whose name is 'John Smith', his address is '123 Drury lane',zip code is 79111, email is 'JSmith@cxr.com', and phone number is '310-805-9801'
UQ2-Update the information of an existing Car with VIN ='1N6AD0CU7EN585013' by adding 10k miles to its current mileage
UQ3-Add a new ticket for the car 'Lexus' that belongs to the customer whose id =1, set the date to the current date, and set the requested service as 'Change Transmission fluid'
       -- depending on your design, given the customer id and car Make is not enough to create a ticket, you may need to find the car's vin number to add the ticket
UQ4-Given the part number ('1000') and the value (-10), Update the part's available quantity (negative value means decrease the quantity)

B.3) Informational Queries: Write queries to answer each of the following

IQ1-How many customers with balance over $50?
IQ2- List all customer names, bills numbers, and each bill balance if the bill balance >0
IQ3- List the history of the car with vin = '4USBU53567L660273'. The history must include all tickets information, associated services, and replaced parts' numbers, descriptions, and used quantities
IQ4- Given part number ('390'), List information of all tickets associated with a service that used that part and the used quantity
IQ5- How many tickets have been made in the interval between the two dates ('2015-01-06', '2015-02-07')?
IQ6- what is the total dollar values (labor and parts) associated with tickets in the previous query (IQ5)?
IQ7- Given a part ID ('1211'), find the information of all suppliers (vendors) for that part?
IQ8- What is the part with highest demand?
IQ9 -What is the smallest, largest and average bill total?
IQ10-What are the parts that are low in stock (available quantity <3) and require reorder? And show all suppliers for that part?

Task B Deliverables:
     1- One MySQL DML script file contains the update queries (UQ1-UQ4) and the informational queries (IQ1-IQ10)
     2- One PDF file contains screenshots to show the output of (IQ1-IQ10)

Final Note: *Your queries will highly depend on your design, so take your time during the design phase and review these queries to make sure your design allows such query to be answered*

Grading Rubric: [Total points: 150]

Tasks		Possible Points
TASK A	**1.1 -Analysis and Design Phase (ERD)**	
	ERD detailed Crow's foot is presented using drawing tool (e.g. Draw.io)	5
	All main Entities present	15
	All relationships present with correct Cardinalities	15
	1.2- DDL (SQL script file: SQL DDL)	
	correct creation of the database schema	4
	correct creation of the Tables, including : **Correct DDL statement and PKs,FKs, Data types, all other constraints**	10
	Correct Relationship mapping, including correct placement of FKs at correct side of each relationship	10
	Correct Normalization of the tables	10
		69 points
TASK B	**B.1 - Adding data**	
	Correct Insertion of the given sample data into the database (either by import or SQL script) -1 points will be deducted on every missing row or incorrect insert into statement of each table	10
	B.2- SQL script for Updating data (Update queries UQ1 to UQ4)	
	Correct Updates statements to update the tables as specified in Task B.2 (UQ1 - UQ4) 4 queries x 4 points	16
	B.3- SQL script for Querying the data (informational queries IQ1 to IQ10)	
	Correct SQL SELECT statements to answer queries in Task B.3 (IQ1-IQ10) 10 queries x 4 points	40
		66 points
Scripts and Output	**Correct script Execution**	
	Entire Task A "DDL" script runs without errors	5
	Entire Task B "DML" script runs without errors	5
	All Task B.3 Queries OUTPUT screen shots are present and correct	5
		15 points
	TOTAL POINTS	**150**

Resources:

1-Given Lectures and Assignments
2-Textbook: Appendixes B and C at the end of the Textbook have some database design examples you can use as guide to your design
3-MySQL documentation website : https://dev.mysql.com/doc/