**Assignment 1**

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**PROBLEM 1**

Follow all the steps in the given order. For you, some steps could be optional and depends on the solution you create.

Hypothetical Problem Scenario: A new business “Hello12 Management team” is trying to establish a “Bed & Breakfast” in Halifax region. They need your help in building their backend information system. They are new in Nova Scotia, and do not have much knowledge about the surroundings or policies etc. They just gave you the following abstract requirements and ideas. “

•Visit multiple bed and breakfast or hotel websites and understand the concepts

•Once you get the business domain knowledge start building a conceptual design for the team

•We can only tell you that for our Bed & Breakfast, we want to offer different types of breakfast items, there will be different types of rooms, and we do not have a swimming pool or gymnasium. However, we can give coupons for those, so that boarders can access those facilities outside. – Hello12 Management team”

**Step 1. Identify at least 8 websites related to hotels or lodging facilities, which are useful for the given requirements, and create a table with a column containing websites URLs, and another column highlighting what information you gathered from those websites. You do not have to run any automated crawler or web scrapping tool. This is just a manual process, so that you get the business domain knowledge.**

|  |  |  |
| --- | --- | --- |
| **No.** | **Website URL** | **Information Gathered** |
|  | <https://www.marriott.com/en-us/hotels/yhzwi-the-westin-nova-scotian/overview/?scid=f2ae0541-1279-4f24-b197-a979c79310b0>  <https://www.seaportsocialhalifax.com/our-menus> | Rooms – Availability of room, Rate, minimum person per room, occupancy available, name of the room, room\_id, checkin date, checkout date.  User – Address, City, State, Zip Code, Planner or a Travel Agent.  Table – no of tables, slot, time, day, seating\_type  Usertable – Firstname, lastname, phone number, email, occasion, any special requests.  Menu – TypeofMenu, price, menuname, menuid, phone\_number. |
|  | <https://www.hilton.com/en/hotels/yhzhhdt-the-hollis-halifax/> | Rooms – typeofroom  Facilities - facility\_id, facilityname, roomid, |
|  | <https://lordnelsonhotel.ca/> | Hotel – Hotelid, hotel name, hotel phone number, hotel contactnumber, email address, website URL |
|  | <https://www.princegeorgehotel.com/> | There can be multiple types of rooms such as - Deluxe guest room, crown service room, Deluxe king suits, Executive suits, The prince suite. But 1 room can be only of one type. |
|  | <https://www.cambridgesuiteshalifax.com/> | Food – onsite service time, offsite service time, menu\_image, quantity, price. |
|  | <https://ca.hotels.com/ho196368/four-points-by-sheraton-halifax-halifax-canada/> | Other policies – pet policy, parking policy  Location – geocoordinates can be considered as derived attribute |
| 7. | <https://www.digbypines.ca/dining-at-digby-pines>  <https://www.digbypines.ca/gift-cards>  <https://www.digbypines.ca/about-digby-pines> | Dining on Terrace  Different type of packages information.  Offers and coupons can be given.  Photos of menu and photos of rooms. |
| 8. | <https://www.foxharbr.com/> | Roomservice information, Room amenities information and viewing menu and order |

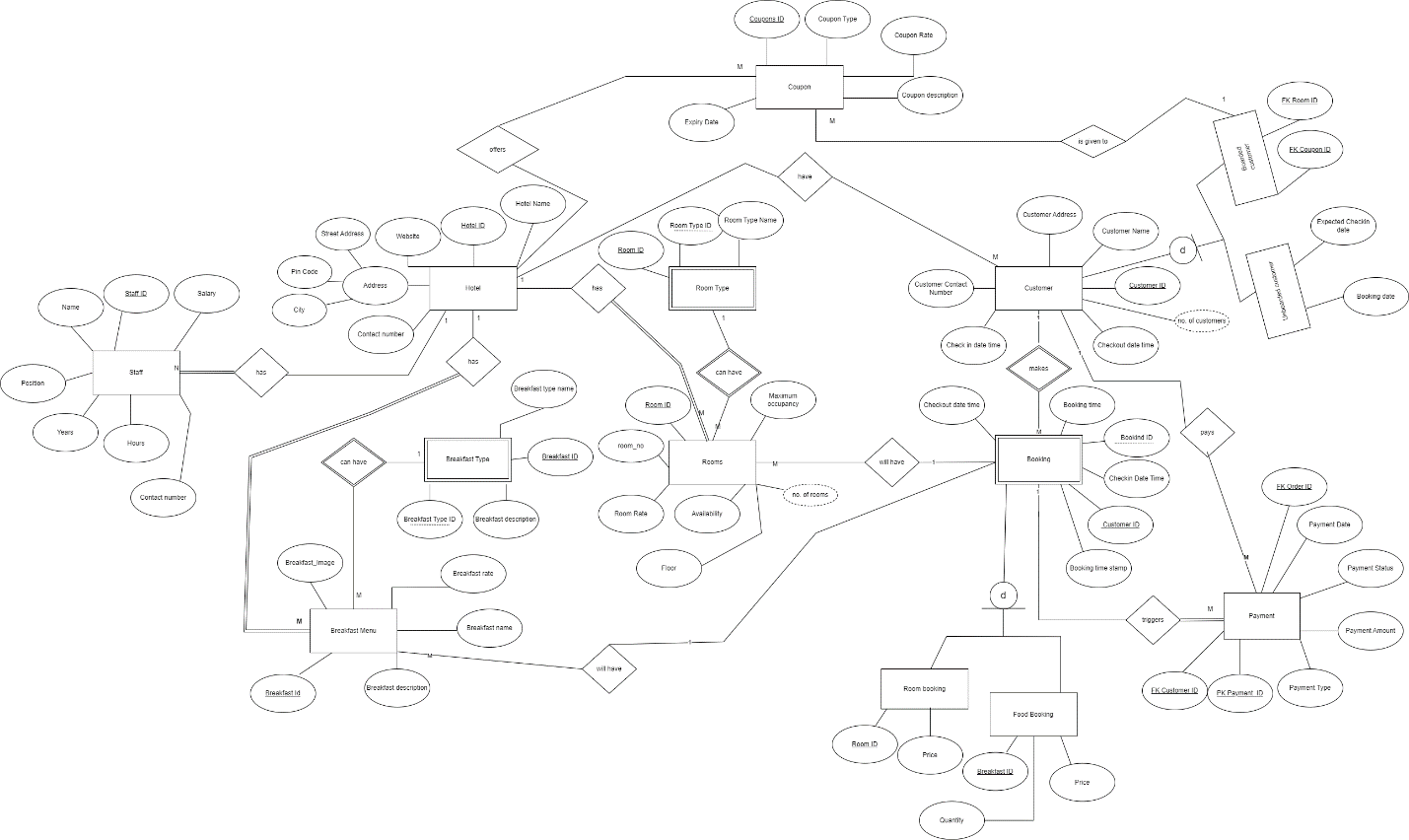
**Step 2. Identify at least 9 unique entities (sub-types are not counted as separate entities for this problem; Only the supertype will be considered as 1 entity), which must contain at least 1 weak entity. Write your assumption in a short paragraph explaining why you considered these entities, and how do you justify your strong entities as strong and weak entities as weak.**

**9 unique entities are as follows**

1. **Hotel (Strong Entity):** It’s identified with hotel\_id. It can exist on its own.
2. **Staff (Strong Entity):** It’s identified with staff\_id. It can exist on its own.It can exist on its own. One hotel can consist of many staff members.
3. **Room (Strong Entity):** It’s identified with room\_id. It can exist on its own. One hotel can have multiple rooms.
4. **Room Types ( Weak Entity ):** It’s partially identified with room type id because One room can only be one type. But different rooms can share the same type of Room. Without rooms, there cannot be a room type. Rooms are crucial for there to be a room type. Therefore, it’s a weak entity.
5. **Breakfast Menu (Strong Entity):** It’s identified with breakfast\_id. It can exist on it’s own since we just have create one hotel. But one hotel can have multiple breakfast menu.
6. **Breakfast Type (Weak Entity):** It’s partially identified with breakfast type. One breakfast item can only be one type. But different breakfast items can be clubbed under the same category of breakfast. Without breakfast, there cannot be a breakfast type. Breakfast is crucial for there to be categorized into a type. Therefore, it’s a weak entity.
7. **Coupons (Strong Entity):** It’s identified with coupon\_id. It can exist on its own. Even before the customer boards the room, coupons exist. Therefore, it’s a strong entity. Moreover, one hotel can have multiple coupons. 1 customer can have many coupons.
8. **Customer (Strong Entity):** It’s identified with customer\_id. It exists on its own. Therefore, it’s a strong entity. It has two subtypes – Boarded customer and unboarded customer. Boarded customers are those customers who have already boarded and paid the amount. They will be given these coupons.
9. **Booking Order (Weak Entity):** It’s partially identified by booking\_id. Booking Id, requires a customer to book. There can be no order without the customer. Moreover, there can be no order without rooms and breakfast. So, it’s a weak entity. It has two subtypes – Room booking and breakfast booking.
10. **Payment (Strong Entity):** It’s identified by payment\_id. And it has foreign key as booking\_id, customer\_id. Payment is associated with a booking\_id.

**Step 3.** Now using Chen model create an ERD or EERD. Your ERD/EERD should highlight all the possible attributes for the entities. In addition, highlight what types of attributes are these, e.g., primary key, partial key, multivalued attribute etc. Note: Your ERD should contain cardinality information, and it should be built using a standard data modelling tool, such as Erwin, Visio, draw.io etc.

I have built the ERD using **draw.io.**



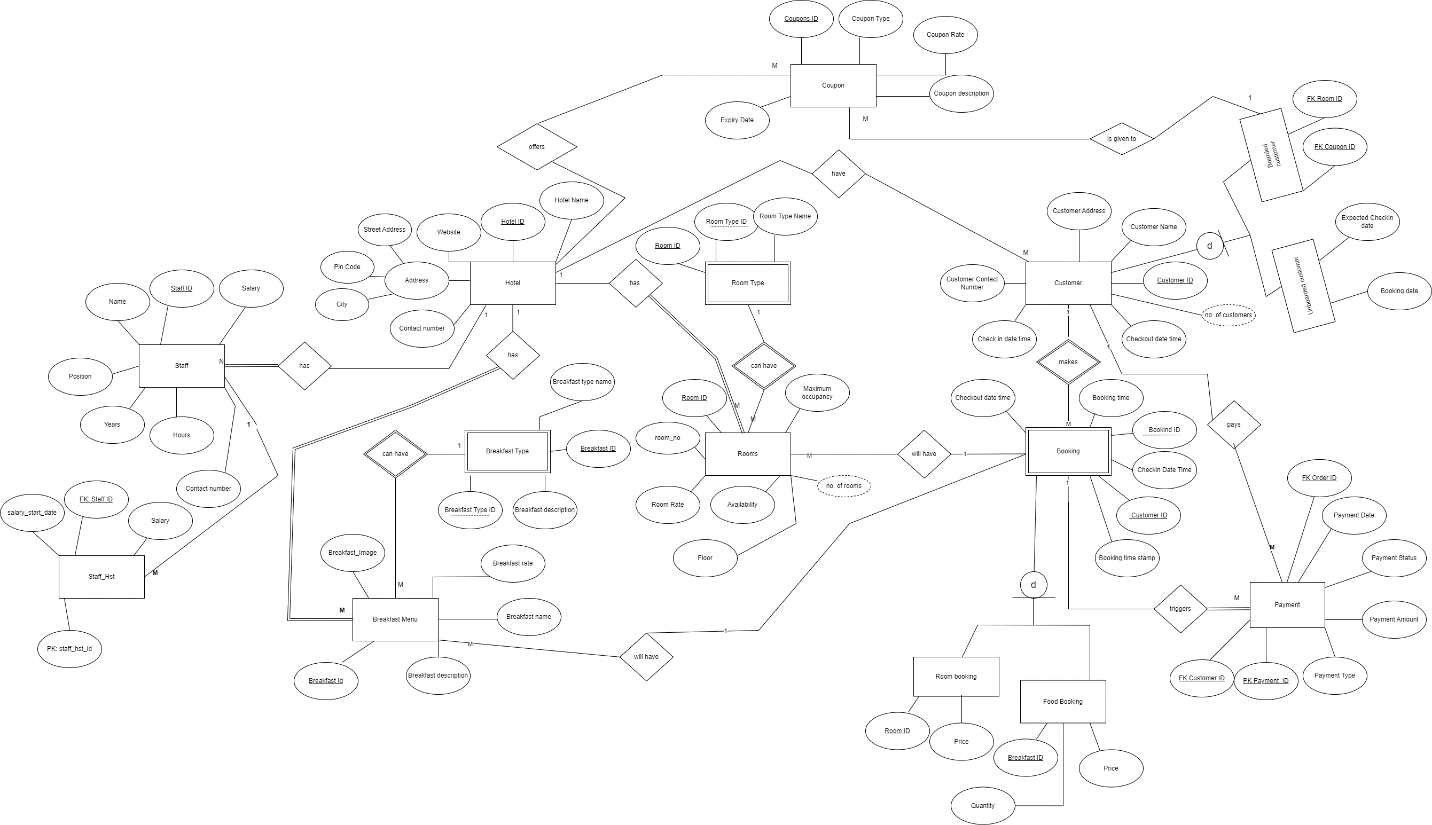
Conceptual\_bedandbreakfast.io

Created using draw.io

**Step 4. Identify if there are any design issues in your ERD. If you find any, then write a short paragraph about the issues, and fix it by generating a refined ERD/EERD By the end of Step 4, you will be completing a conceptual model. Now, it is time to move to Logical mapping.**

Staff\_Hst: staff\_hst\_id (Primary Key), staff\_id ( Foreign Key), salary\_start\_date, amount. There are no major issues found in the design created in step 3. But to maintain historical data of staff members’ pay slip, I am adding the above entity staff\_hst having attributes like described above.

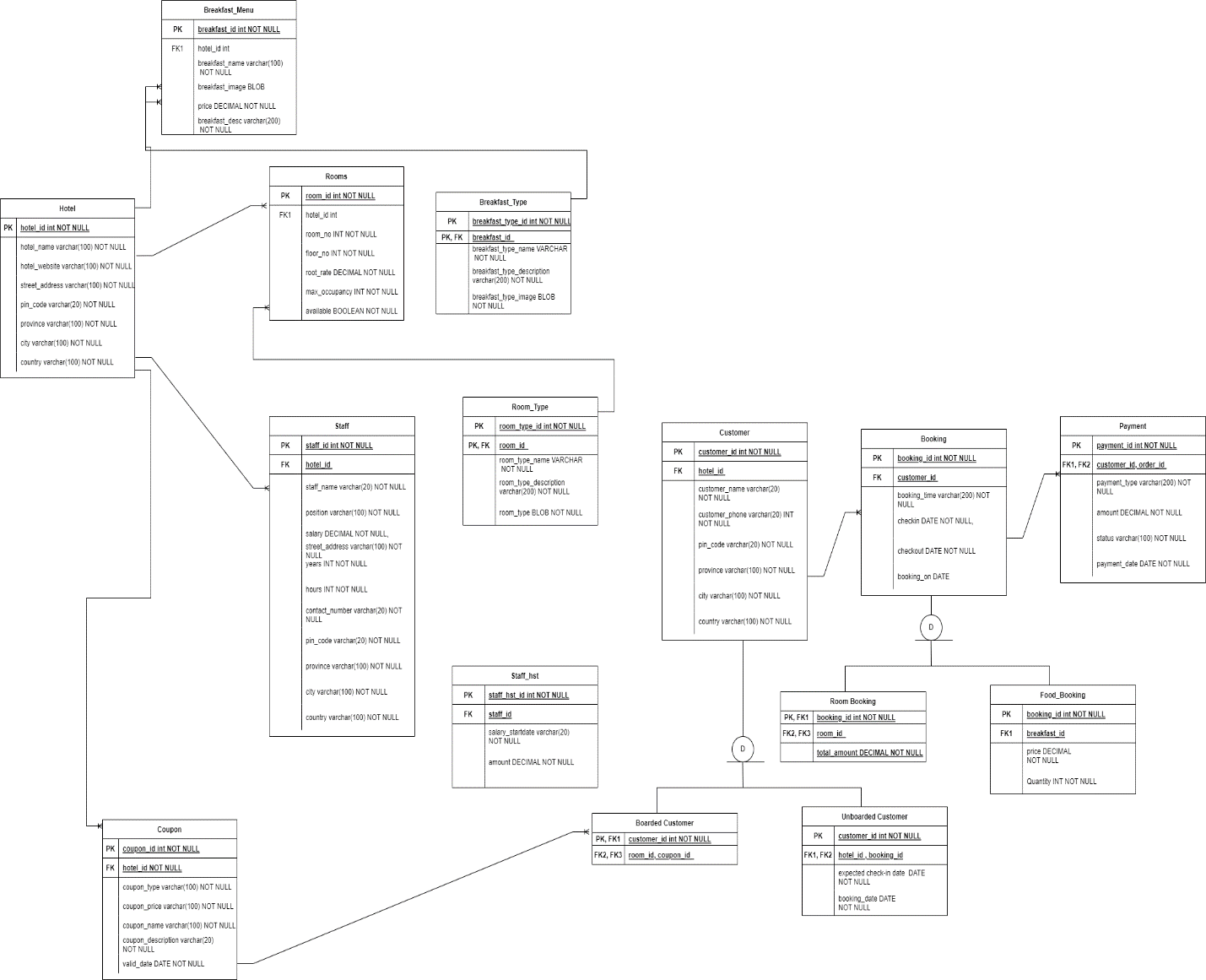
**Revised conceptual ERD diagram**

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revised\_conceptual

Created using draw.io

**Step 5. Consider each entity from your data model as a table. Now, create a tabular structure with the attributes only (no need to consider any data points; just attributes are needed), and write a short paragraph and/or couple of bullet points to highlight the dependencies that exist in your logical model.**

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logical\_model

Created using draw.io

In the **Hotel** table, hotel\_id is the primary key and all the attributes are dependent on hotel\_id.

In the **Rooms** Table, room\_id is the primary key and all the attributes are dependent on the room\_id. Here, hotel\_id acts as the foreign key. One cell has one value in this table.

In the **Room\_Type** table, room\_id and room\_type\_id collectively forms the primary key and all attributes are dependent on the room\_type\_id. It’s a weak entity.

In the **Staff** table, staff\_id is the primary key and all the other attributes are dependent on the staff\_id. And hotel\_id acts as the foreign key. One cell has one value in this table.

In the **coupon** table, coupon\_id is the primary key and all the other attributes are dependent on the coupon\_id. And hotel\_id acts as the foreign key. One cell has one value in this table.

In the **Breakfast\_Menu** Table, breakfast\_id is the primary key and all the attributes are dependent on the breakfast\_id. Here, hotel\_id acts as the foreign key. One cell has one value in this table.

In the **Breakfast\_Type** table, breakfast\_type\_id and breakfast\_id collectively forms the primary key and all attributes are dependent on the breakfast\_type\_id. It’s a weak entity, dependent on the **Breakfast\_Menu** table.

In the **Customer** Table, customer\_id is the primary key and all other attributes are dependent on the customer \_id. Here, hotel\_id acts as the foreign key. One cell has one value in this table.

This has 2 subtypes:

1. Boarded customer: Here, customer\_id is both the primary key and the foreign key. It has two foreign keys – room\_id and couple\_id
2. Unboarded customer – Here, customer\_id is both the primary key and the foreign key. It has two foreign keys – hotel\_id and booking\_id.

In the **Booking** Table, booking\_id is the primary key and all other attributes are dependent on the booking\_id. Here, customer\_id acts as the foreign key. One cell has one value in this table.

This has 2 subtypes

1. Room Booking – It has booking\_id as the primary key and the foreign key. It also has one additional foreign key room\_id. Total amount comes from the room\_id.
2. Food Booking – It has booking\_id as the primary key and the foreign key. It also has one additional foreign key breakfast\_id. Price and Quantity comes from the breakfast\_id.

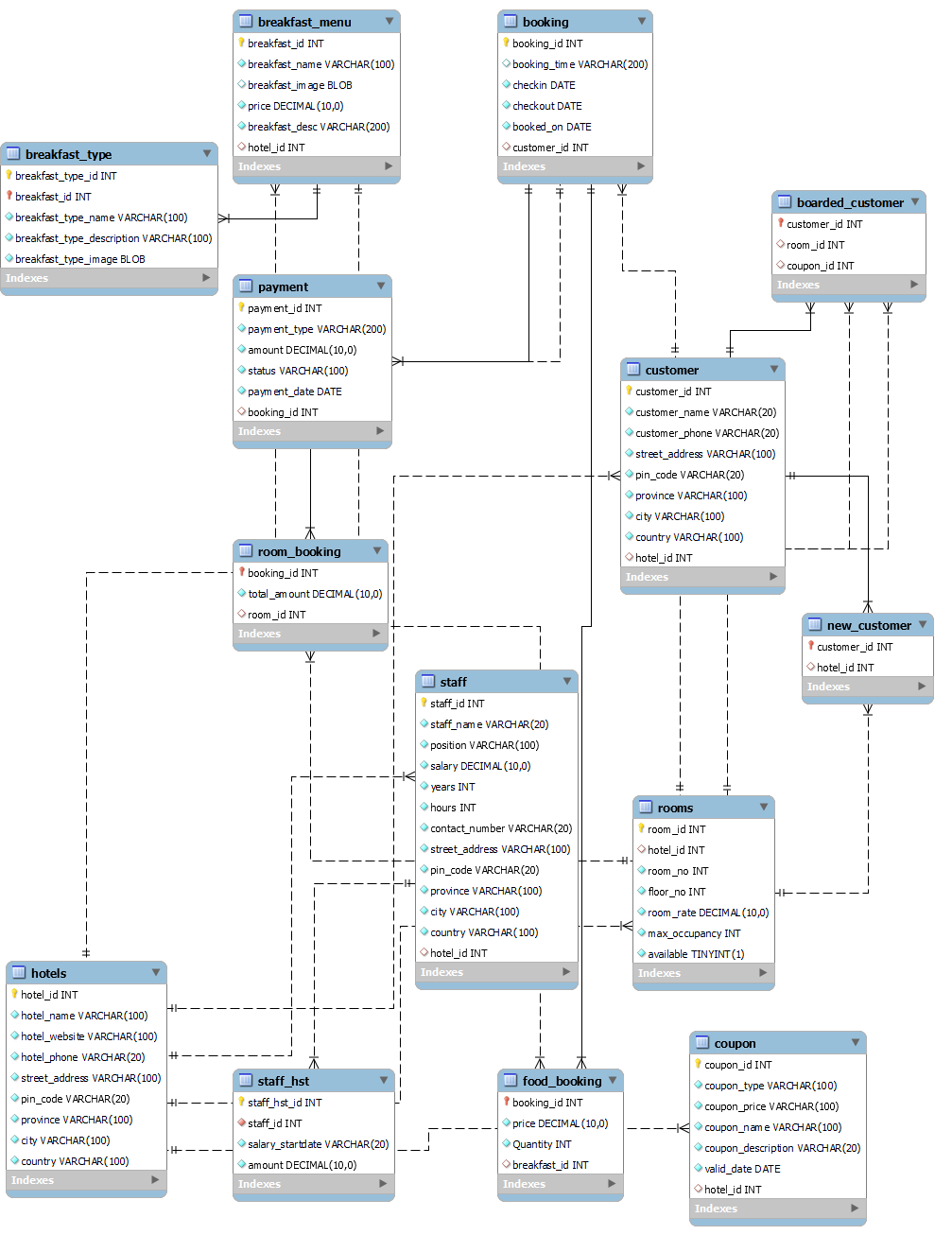
In the **Payment** table, payment\_id is the primary key and customer\_id and order\_id acts as the foreign key. All attributes are dependent on the primary\_key.

**Step 6. If required, perform some level of normalization (1NF->2NF->3NF), and write your assumptions on why you considered this normalization.**

It’s not required for the current design.

**Step 7. Now, create a database named “BedBreakfast”, and create empty tables based on your final logical model by writing DDL SQL query in MySQL Workbench. This will give you the physical model.**

**Physical Model is as follows**



Physical\_model\_bed\_breakfast

**Step 8.** Export the SQL Dump of your MySQL Database and submit it as part of your assignment.

**DDL SQL Query is as follows**

**CREATE SCHEMA BedBreakfast;**

**USE BedBreakfast;**

**CREATE TABLE Hotels (**

**hotel\_id INT PRIMARY KEY NOT NULL,**

**hotel\_name VARCHAR(100) NOT NULL,**

**hotel\_website varchar(100) NOT NULl,**

**hotel\_phone varchar(20) NOT NULL,**

**street\_address VARCHAR(100) NOT NULL,**

**pin\_code VARCHAR(20) NOT NULL,**

**province VARCHAR(100) NOT NULL,**

**city varchar(100) NOT NULL,**

**country VARCHAR(100) NOT NULL**

**);**

**CREATE TABLE Rooms (**

**room\_id INT PRIMARY KEY,**

**hotel\_id INT,**

**room\_no INT NOT NULL,**

**floor\_no INT NOT NULL,**

**room\_rate DECIMAL NOT NULL,**

**max\_occupancy INT NOT NULL,**

**available BOOLEAN NOT NULL,**

**FOREIGN KEY (hotel\_id) REFERENCES Hotels(hotel\_id) ON DELETE CASCADE**

**);**

**select \* from hotels;**

**CREATE TABLE Staff(**

**staff\_id int NOT NULL PRIMARY KEY,**

**staff\_name varchar(20) NOT NULL,**

**position varchar(100) NOT NULL,**

**salary DECIMAL NOT NULL,**

**years INT NOT NULL,**

**hours INT NOT NULL,**

**contact\_number varchar(20) NOT NULL,**

**street\_address VARCHAR(100) NOT NULL,**

**pin\_code VARCHAR(20) NOT NULL,**

**province VARCHAR(100) NOT NULL,**

**city varchar(100) NOT NULL,**

**country VARCHAR(100) NOT NULL,**

**hotel\_id INT,**

**FOREIGN KEY (hotel\_id) REFERENCES Hotels(hotel\_id) ON DELETE CASCADE**

**);**

**CREATE TABLE Staff\_hst (**

**staff\_hst\_id INT NOT NULL PRIMARY KEY,**

**staff\_id INT NOT NULL,**

**salary\_startdate VARCHAR(20) NOT NULL,**

**amount DECIMAL NOT NULL,**

**FOREIGN KEY (staff\_id) REFERENCES Staff(staff\_id) ON DELETE CASCADE**

**);**

**CREATE TABLE Breakfast\_Menu(**

**breakfast\_id int NOT NULL PRIMARY KEY,**

**breakfast\_name varchar(100) NOT NULL,**

**breakfast\_image BLOB,**

**price DECIMAL NOT NULL,**

**breakfast\_desc varchar(200) NOT NULL,**

**hotel\_id INT,**

**FOREIGN KEY (hotel\_id) REFERENCES Hotels(hotel\_id) ON DELETE CASCADE**

**);**

**CREATE TABLE Breakfast\_Type (**

**breakfast\_type\_id INT,**

**breakfast\_id INT,**

**breakfast\_type\_name VARCHAR(100) NOT NULL,**

**breakfast\_type\_description VARCHAR(100) NOT NULL,**

**breakfast\_type\_image BLOB NOT NULL,**

**PRIMARY KEY (breakfast\_type\_id, breakfast\_id),**

**FOREIGN KEY (breakfast\_id) REFERENCES Breakfast\_Menu(breakfast\_id) ON DELETE CASCADE**

**);**

**CREATE TABLE COUPON(**

**coupon\_id int NOT NULL PRIMARY KEY,**

**coupon\_type varchar(100) NOT NULL,**

**coupon\_price varchar(100) NOT NULL,**

**coupon\_name varchar(100) NOT NULL,**

**coupon\_description varchar(20) NOT NULL,**

**valid\_date DATE NOT NULL,**

**hotel\_id INT,**

**FOREIGN KEY (hotel\_id) REFERENCES Hotels(hotel\_id) ON DELETE CASCADE**

**);**

**CREATE TABLE CUSTOMER(**

**customer\_id int NOT NULL PRIMARY KEY,**

**customer\_name varchar(20)NOT NULL,**

**customer\_phone varchar(20) NOT NULL,**

**street\_address VARCHAR(100) NOT NULL,**

**pin\_code VARCHAR(20) NOT NULL,**

**province VARCHAR(100) NOT NULL,**

**city varchar(100) NOT NULL,**

**country VARCHAR(100) NOT NULL,**

**hotel\_id INT,**

**FOREIGN KEY (hotel\_id) REFERENCES Hotels(hotel\_id) ON DELETE CASCADE**

**);**

**CREATE TABLE BOARDED\_CUSTOMER(**

**customer\_id int NOT NULL PRIMARY KEY,**

**room\_id INT,**

**FOREIGN KEY (room\_id) REFERENCES Rooms(room\_id) ON DELETE CASCADE,**

**coupon\_id INT,**

**FOREIGN KEY (coupon\_id) REFERENCES Rooms(room\_id) ON DELETE CASCADE,**

**FOREIGN KEY (customer\_id) REFERENCES CUSTOMER(customer\_id) ON DELETE CASCADE**

**);**

**CREATE TABLE NEW\_CUSTOMER(**

**customer\_id int NOT NULL PRIMARY KEY,**

**hotel\_id INT,**

**FOREIGN KEY (hotel\_id) REFERENCES Rooms(hotel\_id) ON DELETE CASCADE,**

**FOREIGN KEY (customer\_id) REFERENCES CUSTOMER(customer\_id) ON DELETE CASCADE**

**);**

**CREATE TABLE BOOKING(**

**booking\_id int NOT NULL PRIMARY KEY,**

**booking\_time varchar(200),**

**checkin DATE NOT NULL,**

**checkout DATE NOT NULL,**

**booked\_on DATE NOT NULL,**

**customer\_id INT,**

**FOREIGN KEY (customer\_id) REFERENCES CUSTOMER(customer\_id) ON DELETE CASCADE**

**);**

**CREATE TABLE Room\_Booking(**

**booking\_id int NOT NULL PRIMARY KEY,**

**total\_amount DECIMAL NOT NULL,**

**room\_id INT,**

**FOREIGN KEY (room\_id) REFERENCES Rooms(room\_id) ON DELETE CASCADE,**

**FOREIGN KEY (booking\_id) REFERENCES BOOKING(booking\_id) ON DELETE CASCADE**

**);**

**CREATE TABLE Food\_Booking(**

**booking\_id int NOT NULL PRIMARY KEY,**

**price DECIMAL NOT NULL,**

**Quantity INT NOT NULL,**

**breakfast\_id INT,**

**FOREIGN KEY (booking\_id) REFERENCES BOOKING(booking\_id) ON DELETE CASCADE,**

**FOREIGN KEY (breakfast\_id) REFERENCES Breakfast\_Menu(breakfast\_id) ON DELETE CASCADE**

**);**

**CREATE TABLE PAYMENT(**

**payment\_id int NOT NULL PRIMARY KEY,**

**payment\_type varchar(200) NOT**

**NULL,**

**amount DECIMAL NOT NULL,**

**status varchar(100) NOT NULL,**

**payment\_date DATE NOT NULL,**

**booking\_id INT,**

**FOREIGN KEY (booking\_id) REFERENCES BOOKING(booking\_id) ON DELETE CASCADE**

**);**

All the sql dumps are added in the bedandbreakfast/sql\_dumps/

**PROBLEM 2**

Follow all the steps in the given order. For you, some steps could be optional and depend on the solution you create. Note: This task does not require any web scrapping or automated information extraction from websites

**Step 1. Visit https://parks.novascotia.ca/ and sub-pages within dal.ca domain. Note: You do not have to consider other provinces or the entire country. The scope is only parks of Nova Scotia.**

**Step 2. Identify at least 8unique entities (sub-types are not counted as separate entities for this problem; Only the supertype will be considered as 1 entity). Write your assumption in a short paragraph explaining why you considered these entities**

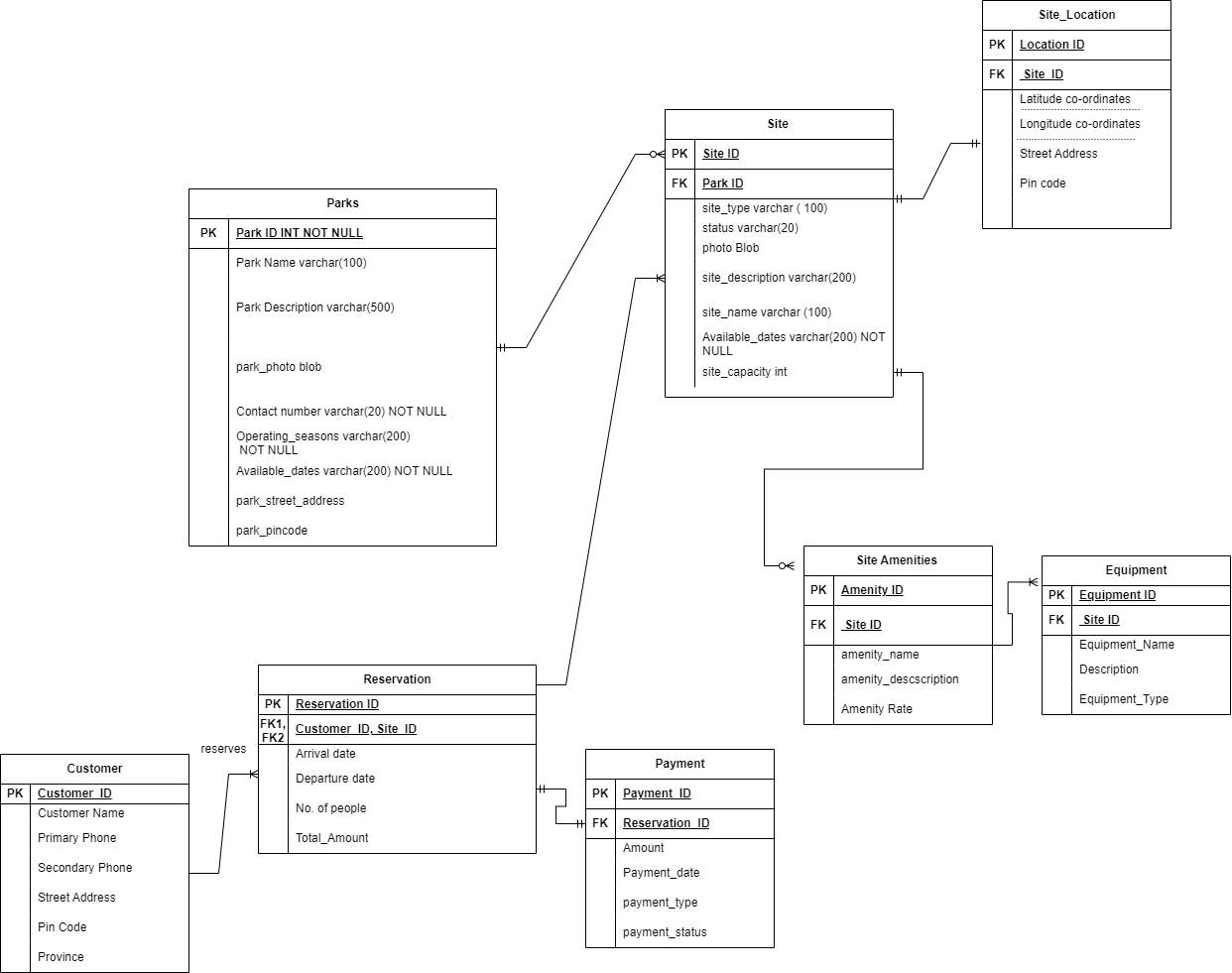
8 unique entities are as follows

1. Parks
2. Site
3. Site Amenities
4. Equipment
5. Location
6. Customer
7. Reservation
8. Payment

I have considered these as entities basis the information I got from the website **https://parks.novascotia.ca/**. As per this website, And each site has many facilities/amenities. Sites can also be filtered using the equipment of choice. Each site is located at a particular place as shown in the list format or the map format in the website. Moreover, a customer can reserve a park and also find the available park and services of their choice. Once a customer has finalized that they want to explore this site and has reserved the spot of their choice, then they can continue with the payment option. 1 park has many sites.

That’s why these entities made the reasonable choice to me. Therefore, I have chosen the above as my entities.

**Step 3. Now using Crow’s foot model create an ERD or EERD. Your ERD/EERD should highlight all the possible attributes for the entities. In addition, highlight what types of attributes are these, e.g., primary key, partial key, multivalued attribute etc. Note: Your ERD should contain cardinality information, and it should be built using a standard data modelling tool, such as Erwin, Visio, draw.io etc.**

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Conceptual\_design

Created using draw.io

**Step 4. Identify if there are any design issues in your ERD. If you find any, then write a short paragraph about the issues, and fix it by generating a refined ERD/EERD By the end of Step 4, you will be completing a conceptual model. Now, it is time to move to Logical mapping.**

No design issues found for now.

**Step 5. Consider each entity from your data model as a table. Since you have designed a crow’s foot model, which has foreign key reference, and every entity is considered as a table, therefore, your design qualifies as a logical model. You do not have to perform any operation at this stage. Exception: If you perform any normalization, then you might need to decompose the structure, and you will need to provide the justification.**

Logical design is same as the conceptual design

**Step 6. Now, create a database, and empty tables by writing DDL SQL query in MySQL Workbench. This will give you the physical model.**

DDL SQL Query is as follows:

CREATE SCHEMA parksnovascotia;

USE parksnovascotia;

CREATE TABLE Parks(

park\_id INT PRIMARY KEY NOT NULL,

park\_name VARCHAR(100) NOT NULL,

park\_description VARCHAR(500) NOT NULL,

park\_photo blob,

park\_contact\_number VARCHAR(20) NOT NULL,

operating\_seasons VARCHAR(200) NOT NULL,

available\_dates VARCHAR(200) NOT NULL,

park\_street\_address VARCHAR(200) NOT NULL,

park\_pincode VARCHAR(20) NOT NULL

);

CREATE TABLE Site(

site\_id INT PRIMARY KEY NOT NULL,

site\_type VARCHAR(100) NOT NULL,

status VARCHAR(20) NOT NULL,

photo BLOB,

site\_description VARCHAR(200) NOT NULL,

site\_name VARCHAR(100) NOT NULL,

available\_dates VARCHAR(200) NOT NULL,

site\_capacity INT,

park\_id INT,

FOREIGN KEY (park\_id) REFERENCES Parks(park\_id) ON DELETE CASCADE

);

CREATE TABLE Site\_Location(

location\_id INT PRIMARY KEY NOT NULL,

site\_street\_address VARCHAR(200) NOT NULL,

site\_pincode VARCHAR(20) NOT NULL,

site\_id INT,

FOREIGN KEY (site\_id) REFERENCES Site(site\_id) ON DELETE CASCADE

);

CREATE TABLE Site\_Amenities(

amenity\_id INT PRIMARY KEY NOT NULL,

amenity\_name VARCHAR(50) NOT NULL,

amenity\_description VARCHAR(200) NOT NULL,

amenity\_price DECIMAL NOT NULL,

site\_id INT,

FOREIGN KEY (site\_id) REFERENCES Site(site\_id) ON DELETE CASCADE

);

CREATE TABLE Equipment(

equipment\_id INT PRIMARY KEY NOT NULL,

equipment\_name VARCHAR(50) NOT NULL,

equipment\_description VARCHAR(500) NOT NULL,

equipment\_type VARCHAR(50) NOT NULL,

site\_id INT,

FOREIGN KEY (site\_id) REFERENCES Site(site\_id) ON DELETE CASCADE

);

CREATE TABLE Customer(

customer\_id INT PRIMARY KEY NOT NULL,

customer\_name VARCHAR(50) NOT NULL,

primary\_phone VARCHAR(20) NOT NULL,

secondary\_phone VARCHAR(20) NOT NULL,

street\_address VARCHAR(200) NOT NULL,

pin\_code VARCHAR(20) NOT NULL,

province VARCHAR(20) NOT NULL

);

CREATE TABLE Reservation (

reservation\_id INT PRIMARY KEY NOT NULL,

arrival\_date DATE NOT NULL,

departure\_date DATE NOT NULL,

no\_of\_people INT NOT NULL,

Total\_amount DECIMAL NOT NULL,

customer\_id INT,

FOREIGN KEY (customer\_id) REFERENCES Customer(customer\_id) ON DELETE CASCADE

);

CREATE TABLE Payment (

payment\_id INT PRIMARY KEY NOT NULL,

Total\_amount DECIMAL NOT NULL,

payment\_date DATE NOT NULL,

payment\_type VARCHAR(20) NOT NULL,

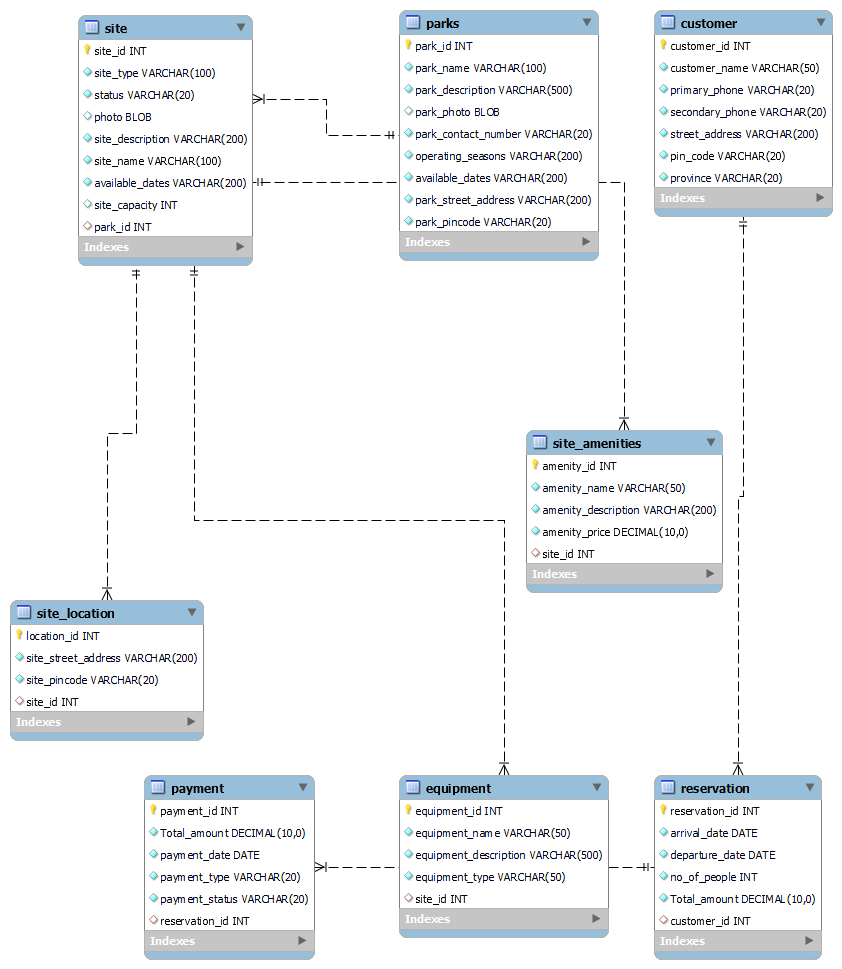
payment\_status VARCHAR(20) NOT NULL,

reservation\_id INT,

FOREIGN KEY (reservation\_id) REFERENCES Reservation(reservation\_id) ON DELETE CASCADE

);

**Physical Model is as follows**

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**Physical\_model\_ns**

**Step 7. Once the physical model is built, export the SQL Dump of the database and table structure.**

SQL Dumps are stored in the A1/ns\_parks/sql\_dumps/

**Step 8. In MySQL Workbench create an ERD by performing reverse engineering. Write your observations on the similarities and differences you found between the ERD generated by you (manual), and ERD generated by MySQL Workbench (automatic).**

All the tables, their cardinalities and their relationships are similar. Differences are in placement of the tables, their cardinalities and their relationships.

**References**

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| --- | --- |
| [1] | C. Coronel, S. Morris, and P. Rob, “DATABASE S YSTEMS,” *Crew.ee*. [Online]. Available: http://corpgov.crew.ee/Materjalid/Database%20Systems%20-%20Design,%20Implementation,%20and%20Management%20(9th%20Edition).pdf. [Accessed: 06-Jun-2023]. |

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| [2] | *Mysql.com*. [Online]. Available: https://dev.mysql.com/doc/workbench/en/wb-data-modeling.html. [Accessed: 06-Jun-2023]. |

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| --- | --- |
| [3] | Learning Corner, “Lecture 10 EER Diagram to relational schema,” 26-Apr-2020. [Online]. Available: https://www.youtube.com/watch?v=zNt-tuVkrzY. [Accessed: 06-Jun-2023]. |