Homework assignment 3

1. The Jonesburgh County Basketball Conference (JCBC) is an amateur basketball association. Each city in the county has one team as its representative. Each team has a maximum of 12 players and a minimum of 9 players. Each team also has up to 3 coaches (offensive, defensive, and physical training coaches). During the season, each team plays 2 games (home and visitor) against each of the other teams. Given those conditions, do the following:

- Identify the connectivity of each relationship.
- Identify the type of dependency that exists between CITY and TEAM.
- Identify the cardinality between teams and players and between teams and city.
- Identify the dependency between COACH and TEAM and between TEAM and PLAYER.
- Draw the Chen and Crow's Foot ERDs to represent the JCBC database.

=> Answer:-

i. Identify the connectivity of each relationship.

- **CITY and TEAM:** There is a 1-to-1 relationship since each city has only one team.
- **TEAM and PLAYER:** This is a 1-to-many relationship as each team has between 9 and 12 players.
- **TEAM and COACH:** This is a 1-to-many relationship, as a team can have up to 3 coaches.
- **TEAM and GAME:** Since each team plays 2 games (home and away) against other teams, the relationship between TEAM and GAME is many-to-many. This would require a junction table for games, capturing the home and visiting teams.

ii. Identify the type of dependency that exists between CITY and TEAM.

- An **existential dependency** exists between CITY and TEAM, as each team must have exactly one city. The team depends on the city for its existence.

iii. Identify the cardinality between teams and players and between teams and city.

- **Teams and Players:** A 1-to-N cardinality (where N is 9 to 12) since each team has 9-12 players.
- **Teams and City:** A 1-to-1 cardinality since each city can have only one team.

iv. Identify the dependency between COACH and TEAM and between TEAM and PLAYER.

- **COACH and TEAM:** There needs to be stronger dependency here because a coach is assigned to a specific team. If the team is deleted, the coach's association might cease, although the coach might still exist.
- **TEAM and PLAYER:** There is a **strong dependency** since players are tied to a specific team. Deleting a team might result in removing its players from the team.

v. Draw the Chen and Crow's Foot ERDs to represent the JCBC database.

- In the **Chen notation**, the entities would be **CITY, TEAM, PLAYER, COACH,** and **GAME**. **CITY** and **TEAM** would have a **1-to-1 relationship**, while **TEAM** and **PLAYER** have a **1-to-many relationship**. **TEAM** and **COACH** would also be **1-to-many**, and **TEAM** and **GAME** would be represented as a **many-to-many relationship**.
- In the **Crow's Foot notation**, the same relationships apply, but the cardinalities will be visually indicated using symbols like crows' feet for "many" and a single line for "one."

2. Create a Crow's Foot notation ERD to support the following business operations:

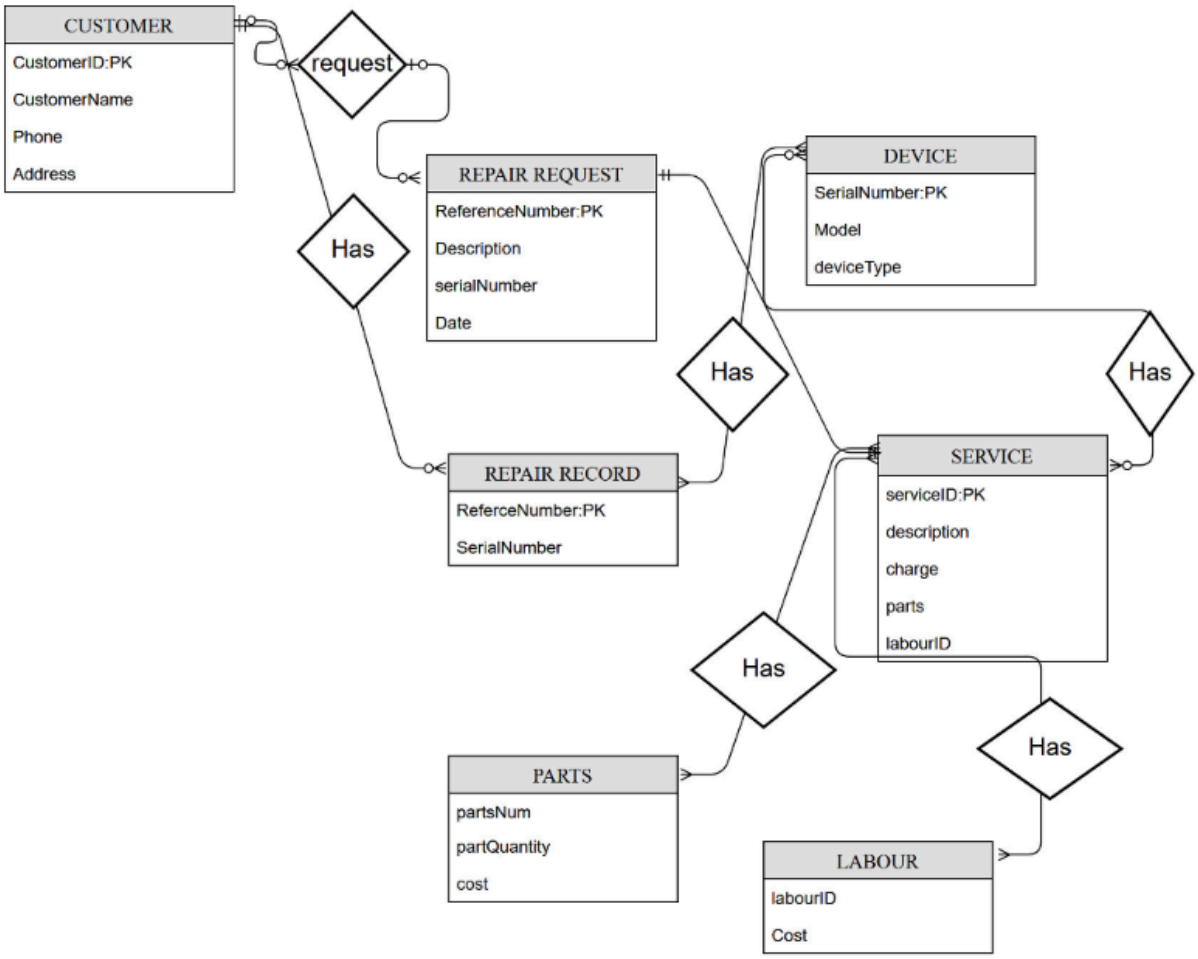
- A friend of yours has opened Professional Electronics and Repairs (PEAR) to repair smartphones, laptops, tablets, and MP3 players. She wants you to create a database to help her run her business.
- When a customer brings a device to PEAR for repair, data must be recorded about the customer, the device, and the repair. The customer's name, address, and a contact phone number must be recorded (if the customer has used the shop before, the information already in the system for the customer is verified as being current). For the device to be repaired, the type of device, model, and serial number are recorded (or verified if the device is already in the system). Only customers who have brought devices into PEAR for repair will be included in this system.
- Because a customer might sell an older device to someone else who then brings the device to PEAR for repair, it is possible for a device to be brought in for repair

by more than one customer. However, each repair is associated with only one customer. When a customer brings in a device to be fixed, it is referred to as a repair request, or just “repair,” for short. Each repair request is given a reference number, which is recorded in the system along with the date of the request, and a description of the problem(s) that the customer wants fixed. It is possible for a device to be brought to the shop for repair many different times, and only devices that are brought in for repair are recorded in the system. Each repair request is for the repair of one and only one device. If a customer needs multiple devices fixed, then each device will require its own repair request.

- There are a limited number of repair services that PEAR can perform. For each repair service, there is a service ID number, description, and charge. “Charge” is how much the customer is charged for the shop to perform the service, including any parts used. The actual repair of a device is the performance of the services necessary to address the problems described by the customer.
- Completing a repair request may require the performance of many services. Each service can be performed many different times during the repair of different devices, but each service will be performed only once during a given repair request.
- All repairs eventually require the performance of at least one service, but which services will be required may not be known at the time the repair request is made. It is possible for services to be available at PEAR but that have never been required in performing any repair.
- Some services involve only labor activities and no parts are required, but most services require the replacement of

one or more parts. The quantity of each part required in the performance of each service should also be recorded. For each part, the part number, part description, quantity in stock, and cost is recorded in the system. The cost indicated is the amount that PEAR pays for the part. Some parts may be used in more than one service, but each part is required for at least one service.

=> Answer



3. What two conditions must be met before an entity can be classified as a weak entity? Give an example of a weak entity.

=> Answer

An entity can be classified as a weak entity if it meets the following two conditions:

I. Existence Dependency:
A weak entity cannot exist without being associated with another "owner" entity, known as the **strong entity**. It has no meaning on its own without a relationship to a strong entity. In other words, the weak entity's existence is dependent on the existence of the strong entity.

II. Lack of a Primary Key:
A weak entity does not have a unique primary key on its own. Instead, it uses a **partial key** (also called a **discriminator**) in combination with the primary key of the strong entity to form a unique identifier. The weak entity relies on the primary key of its associated strong entity to uniquely identify its instances.

➔ **Example:**
In a library database, an example of a weak entity could be a **Loan**.

- **Strong Entity**: `Member` (with a `MemberID` as its primary key).
- **Weak Entity**: `Loan` (representing the act of borrowing a book, but it cannot exist without a member borrowing it).

A **Loan** does not have a unique identifier on its own but uses the `MemberID` (from the strong entity `Member`) along with a partial key like `LoanID` to uniquely identify each loan. The `Loan` entity is **existence-dependent** on the `Member` entity.