**Higher National Diploma in Information Technology**

**Database Management Systems**

**Year 1 Semester 2**

**Tutorial 01 –ER Diagrams**

1. Consider the following information about an Engineering enterprise.

* Each engineer works on a number of projects. For every engineer a record is kept of his/her number, name, title and address(attributes). The number(primary key) is used to identify an engineer uniquely.
* For every project a record is kept of its unique number(primary key) , name, budget, expenses, inHand and location. The inHand attribute is calculated as (Budget-expenses). Additionally, the responsibility each engineer has on a particular project and the amount of time spent on the project is noted. Each project has a number of engineers working on it.
* Clients contract these projects. The clients name, address and phone number must be recorded. The address(composite attribute) is composed of home number, street, city and zip code . A client can have multiple phone numbers multiplication attribute and all his numbers need to be stored. A client is identified using the unique client number(primary key).
* The contract date, i.e. the date at which the client signs the contract for a specific project is also noted. A client can contract multiple projects and a given project can be contracted by only one client. Every project is contracted by some client.
* A record is also kept of the machinery being used for a particular project. The name, quantity and the date the machinery is needed for the project is recorded.
* A project can use many number of machineries and given machinery can be used in multiple projects. Every project uses some machinery.

1. Draw an Entity Relationship (ER) diagram to capture the above information. Indicate primary keys, key constraints and participation constraints.
2. Include any attributes that you think are necessary. State why. Write any assumptions you make.
3. Explain the following terms using suitable examples.
   1. Primary key
   2. Super key
   3. Candidate key
   4. Foreign key
   5. Multivalued attribute
   6. Derived attribute
   7. Composite attribute

**Primary key**

Primary key is one of the candidate keys.

Eno(Engineer), Pro\_Number(Project), ClientNo(Client), MachineID(Machine)

**Super key**

A set of one or more attributes whose values uniquely determine one entity.

Eno(Engineer), Pro\_Number(Project), ClientNo(Client), MachineID(Machine)

**Candidate key**

If there are more than one key attribute, it is called as candidate key.

Eno(Engineer), Pro\_Number(Project), ClientNo(Client), MachineID(Machine)

**Foreign key**

Foreign key is used to link tables.

**Multivalued attribute**

A set of values for the same entity.

PhoneNo(Client)

**Derived attribute**

Derived attribute is computed the value using stored attributes.

**Composite attribute**

An attribute is composed of many other attributes.

Address(Client)

Diagram

Description automatically generated