Part 1 Conceptual Model

Entity Name	Multiplicity	Relationship	Multiplicity	Entity Name
Employee	1..*(1)	Performs	1..*(2)	Requirement
Client	1..1(3)	Has	1..*(4)	Requirement
Requirement	0..*(5)	Needs	1..*(6)	Equipment

Relationships:
Employee- Requirement *..*
Client-Requirement 1..*
Requirement-Equipment *..*

(1) Requirements can be performed by 1 or many employees.
(2) Employee performs 1 or many requirements.
(3) Client can have 1 to many requirements.
(4) Requirement can be owned by one client.
(5) Equipment can be use for any or many requirements.
(6) Requirement needs 1 or many equipment.

Primary Keys and Candidate Keys
Client: Primary Key: clientNo Candidate Key:telNo
Employee: Primary Key: staffNo Candidate Key:telNo
Equipment: Primary Key: equipmentID
Requirement: Primary Key: requirementID

Part 2 Logical Model

Derived Relations
For our design there are 1 to many zero to many relationships. So, we need to add relations that have primary keys from parent relations.

Perform (requirementID(PK), staffNo(PK), workTime)
Need (requirementID(PK), equipmentID(PK), dateOfUse)

Dependencies
staffNo → fName, lName, salary, address, telNo

requirementID → startDate, startTime, duration, comments
clientNo → clientName, telNo, address
equipmentID → description, usage, cost
requirementID, staffNo → workTime
requirementID, equipmentID → dateOfUse

Normalization

1NF

Our model was created from conceptual model, so it is already first normal form.

Employee (staffNo(PK), fName, lName, salary, address, telNo)
Requirement (requirementID(PK), startDate, startTime, duration, comments)
Client (clientNo(PK), clientName, telNo, address)
Equipment (eqipmentID(PK), description, usage, cost, clientNo(FK))
Perform (requirementID(PK), staffNo(PK), worktime)
Need (requirementID(PK), equipmentID(PK), dateOfUse)

2NF

There isn't any partial dependency in the model. So, the model already fits second normal form.

3NF

There isn't any transitive dependency in the model. So, the model already fits third normal form.

User Transaction

Client

clientNo	clientName	telNo	address
10	The Cardboard Box Company	4342344565	602 Buttonwood Drive Braintree, MA 02184
11	P.Nuttall	5678909090	64 Devon Ave. Atwater, CA 95301
12	Rathskeller	8786542222	9106 Cardinal Street Culpeper, VA 22701
13	Aviation Center	7776665555	50 Beaver Ridge St. Largo, FL 33771
14	Oceans Eleven	4543335566	8185 High Noon Street Westbury, NY 11590
15	Staples Center	9899008700	75 Railroad Road Butte, MT 59701

Employee

staffNo	fName	lName	salary	address	telNo
101	John	Smith	18	123 down street	7279877890
102	Kevin	Hart	18	14 up street	3235659870
103	Eddie	Murphy	18	12 front blvd	4342348765

104	Kyrie	Irving	18	19 west way	8765674567
105	Damian	Lillard	18	24 heat way	7673456756

Equipment

equipmentID	description	usage	cost
201	Steam Power Wash	0	200
202	Industrial floor cleaner	0	500
203	antibiotic sprayer	0	100
204	Industrial wall cleaner	0	400
205	Industrial Ceiling cleaner	0	600

Requirement

requirementID	startDate	startTime	duration	comments	clientNo
1	2024-01-01	09:00	6	No chemicals for cleaning	12
2	2024-01-02	09:00	4	Floors need industrial clean	10
3	2024-03-03	10:00	3	disinfect with antibiotic sprayer	11
4	2024-04-04	07:00	8	Walls need industrial clean	14
5	2024-05-05	17:00	4	Ceilings need industrial clean	15

Need

requirementID	equipmentID	dateOfUse
1	201	2024-01-01
2	202	2024-01-02
3	203	2024-03-03
4	204	2024-04-04
5	205	2024-05-05

Perform

requirementID	staffNo	worktime
1	101	6
2	102	4
3	103	3
4	104	8
5	105	4

Our database has passed the user transaction.

Constraints

Primary key constraints:

The primary key should be unique and not null.

staffNo is the primary key for the Employee.
clientNo is the primary key for the Client.
equipmentID is the primary key for the Equipment.
requirementID is the primary key for the Requirement.

Foreign key constraints:
If a foreign key is with the value, it must refer to parent relation.
staffNo in Perform references staffNo in Employee.
requirementID in Perform references requirementID in Requirement.
clientNo in Has references clientNo in Client.
requirementID in Has references requirementID in Requirement.
equipmentID in Need references equipmentID in Equipment.
requirementID in Need references requirementID in Requirement.

Alternate key constraints:
telNo is a candidate key for both Employee and Client.

General constrains:
StartDate must be later than current date.

Part 3 Implementation

Database was created in python with embedded SQL.
SuperMaid_GYY.py file was used for creating database.
Queries,py was used for creating necessary queries and checks.

Github Link: https://github.com/kkkkkikikiki/CSC623-Project