**RELATIONAL SCHEMA**

Step 1: Mapping of Regular Entity Sets

DOCTOR

| Doctor_ID | DAddress | D_Salary | DHistory | DFirst_Name | DLast_Name | D_Title | DPhone_Number | Doctor_mail | DSex | Room_Number | D_Job | D_Age |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

PATIENT

| Patient_ID | PSex | PFirst_Name | PLast_Name | PAddress | P_Birth_date | Discharged | Admitted | PAge |
|---|---|---|---|---|---|---|---|---|

FOREIGN KEY

P_PHONENUMBER

| Patient_ID | P_Phone_Number |
|---|---|

NURSE

| Nurse_ID | NPhone_Number | N_Salary | NHistory | NEmail | NAddress | N_Degree | NSex | N_LastName | N_FirstName |
|---|---|---|---|---|---|---|---|---|---|

MEDICINE

| Medicine_ID | Price | Quantity |
|---|---|---|

LABORATORY

| LAB_ID | LType |
|---|---|

ROOMS

| Rooms_ID | Rperiod | Room_price |
|---|---|---|

FOREIGN KEY

ROOMTYPE

| Rooms_ID | Room_type |
|---|---|

DEPARTMENT

| Department_ID | Departmentname | Dep_Capacity |
|---|---|---|

SHIFT

| Shift_ID | SEnd | SDate | SStart |
|---|---|---|---|

EMPLOYEE

| Employee_ID | EType | ESalary | EEmail | ELastName | EFirstName | ESex | EAge |
|---|---|---|---|---|---|---|---|

PRESCRIPTION

| Prescription_ID | P_Time | Fee | P_Date |
|---|---|---|---|

DESK_CLERK

| Clerk_ID | Clerk_Num | CFirst_Name | CLast_Name |
|---|---|---|---|

SURGERY

| Op_ID | SDepartment | Op_price | STime |
|---|---|---|---|

- In this step, firstly we set the strong entities in a relation R that contains all the basic attributes of E.
- Then we choose the key attributes of E as the primary key for R.
- If E is the chosen key as a composite(Ex (PName: PFirst_Name, Plast_Name)), then the set of the simple attributes inside that form will together be the primary key of R.
- Our entity set has two multi-valued attributes (P_Phone Number, Room_type) M of E, we did not include them in the relation R. Moreover we made a foreign key constraint that includes the primary key attributes of E because we did not create a new relation schema RM which contains the M as the attribute and the primary key of E.

Step 2: Mapping of Weak Entity Sets

DOCTOR

| Doctor_ID | DAddress | D_Salary | DHistory | DFirst_Name | DLast_Name | D_Title | DPhone_Number | Doctor_mail | DSex | Room_Number | Room_Number | D_Job | D_Age |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

PATIENT

| Patient_ID | PSex | PFirst_Name | PLast_Name | PAddress | P_Birth_date | Discharged | Admitted | PAge |
|---|---|---|---|---|---|---|---|---|

FOREIGN KEY

P_PHONENUMBER

| Patient_ID | P_Phone_Number |
|---|---|

NURSE

| Nurse_ID | NPhone_Number | N_Salary | NHistory | NEmail | NAddress | N_Degree | NSex | N_LastName | N_FirstName |
|---|---|---|---|---|---|---|---|---|---|

MEDICINE

| Medicine_ID | Price | Quantity |
|---|---|---|

LABORATORY

| LAB_ID | LType |
|---|---|

ROOMS

| Rooms_ID | Rperiod | Room_price |
|---|---|---|

ROOMTYPE

| Rooms_ID | Room_type |
|---|---|

DEPARTMENT

| Department_ID | Departmentname | Dep_Capacity |
|---|---|---|

FOREIGN KEY

SHIFT

| Shift_ID | SEnd | SDate | SStart |
|---|---|---|---|

EMPLOYEE

| Employee_ID | EType | ESalary | EEmail | ELastName | EFirstName | ESex | EAge |
|---|---|---|---|---|---|---|---|

PRESCRIPTION

| Prescription_ID | P_Time | Fee | P_Date |
|---|---|---|---|

DESK_CLERK

| Clerk_ID | Clerk_Num | CFirst_Name | CLast_Name |
|---|---|---|---|

SURGERY

| Op_ID | SDepartment | Op_price | STime |
|---|---|---|---|

APPOINTMENT

| Patient_ID | ATime | ADate | Atype |
|---|---|---|---|

- We created one weak entity set W in the ER schema and then we include a relation R and it contains all simple attributes of W as attributes R.
- In addition, it includes foreign key attributes of R the primary keys of the relations that correspond to the owner entity set.
- The combination of the primary key of the owner and the partial key of the weak entity form W, if any, is the primary key of R.

Step 3: Mapping of Relationship Sets

CONTAINS

| Medicine_ID | Prescription_ID |
|---|---|

→MEDICINE → PRESCRIPTION

ATTEND

| Doctor_ID | On_ID | Surgery_Count |
|---|---|---|

→ DOCTOR → SURGERY

WORKS IN

| Employee_ID | Department_ID |
|---|---|

→ EMPLOYEE →DEPARTMENT

HAS

| Doctor_ID | Department_ID |
|---|---|

→ DOCTOR → DEPARTMENT

ASSIGNED

| Patient_ID | Rooms_ID |
|---|---|

→ PATIENT → ROOMS

GIVE SAMPLE

| Patient_ID | LAB_ID |
|---|---|

→PATIENT →LABORATORY

GET TREATMENT

| Patient_ID | Doctor_ID |
|---|---|

→ PATIENT → DOCTOR

INCLUDE

| Rooms_ID | Equipment_ID |
|---|---|

→ ROOMS → EQUIPMENT

SERVE

| Employee_ID | Shift_ID |
|---|---|

→ EMPLOYEE → SHIFT

GOVERNS

| Rooms_ID | Nurse_ID |
|---|---|

→ ROOMS →NURSE

WRITE

| Prescription_ID | Doctor_ID |
|---|---|

→PRESCRIPTION → DOCTOR

GIVE

| Clerk_ID |
|---|

→ DESK_CLERK

TAKE

| Prescription_ID | Patient_ID |
|---|---|

→ PRESCRIPTION → PATIENT

SET_TREATMENT

| Patient_ID | Department_ID |
|---|---|

→ PATIENT → DEPARTMENT

- We created a relational schema for the relationship set R.
- We use all of the primary keys of contributing relation schemas in the relation schema's attributes, and if there are any informative attributes, we use them as well.
- Firstly we decide on the primary key:
- 1:1 case: We need to choose the primary key of any of the two participating entity sets.
- M: N case: We need to choose the union of all primary keys of the participating entity sets.
- 1:N or N:1 case: We select the primary key in relation to the entity set having the N ratio.
- N-ary case with one entity having 1 ratio: We select the union of all primary keys in the participating entity set with a cardinality ratio of less than one.
- N-ary case: We select the union of all primary keys of the entity sets that are participating.
- We need to add related foreign key constraints, and for the part recursive relationship sets, the attribute names are based on the role names.

Step 4: Combination of Schemas

DOCTOR

| Doctor_ID | DAddress | D_Salary | DHistory | DFirst_Name | DLast_Name | D_Title | DPhone_Number | Doctor_mail | DSex | Room_Number | Department_ID | D_Job | D_Age |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

→DEPARTMENT

HAS

| DDoctor_ID | Department_ID |
|---|---|

→ DOCTOR → DEPARTMENT

PATIENT

| Patient_ID | PSex | PFirst_Name | PLast_Name | PAddress | P_Birth_date | Discharged | Admitted | PAge | Rooms_ID |
|---|---|---|---|---|---|---|---|---|---|

→ROOMS

P_PHONENUMBER

| Patient_ID | P_Phone_Number |
|---|---|

ASSIGNED

| Patient_ID | Rooms_ID |
|---|---|

→ PATIENT → ROOMS

NURSE

| Nurse_ID | NPhone_Number | N_Salary | NHistory | NEmail | NAddress | N_Degree | NSex | N_LastName | N_FirstName |
|---|---|---|---|---|---|---|---|---|---|

MEDICINE

| Medicine_ID | Price | Quantity |
|---|---|---|

LABORATORY

| LAB_ID | LType |
|---|---|

ROOMS

| Rooms_ID | Rperiod | Room_price |
|---|---|---|

ROOMTYPE

| Rooms_ID | Room_type |
|---|---|

DEPARTMENT

| Department_ID | Departmentname | Dep_Capacity |
|---|---|---|

ATTEND

| Doctor_ID | On_ID | Surgery_Count |
|---|---|---|

SHIFT

| Shift_ID | SEnd | SDate | SStart |
|---|---|---|---|

EMPLOYEE

| Employee_ID | EType | ESalary | EEmail | ELastName | EFirstName | ESex | EAge | Department_ID | Shift_ID |
|---|---|---|---|---|---|---|---|---|---|

→DEPARTMENT →SHIFT

WORKS IN

| Employee_ID | Department_ID |
|---|---|

→ EMPLOYEE →DEPARTMENT

SERVE

| Employee_ID | Shift_ID |
|---|---|

→ EMPLOYEE → SHIFT

PRESCRIPTION

| Prescription_ID | P_Time | Fee | P_Date | Patient_ID | Doctor_ID |
|---|---|---|---|---|---|

→ PATIENT →DOCTOR

TAKE

| Prescription_ID | Patient_ID |
|---|---|

→ PRESCRIPTION → PATIENT

WRITE

| Prescription_ID | Doctor_ID |
|---|---|

→PRESCRIPTION → DOCTOR

SURGERY

| Op_ID | SDepartment | Op_price | STime |
|---|---|---|---|

APPOINTMENT

| Patient_ID | ATime | ADate | Atype |
|---|---|---|---|

DESK_CLERK

| Clerk_ID | Clerk_Num | CFirst_Name | CLast_Name |
|---|---|---|---|

- For N:1 and 1:N relationships, where N is the total number of participants, by shifting its attributes, combine the schema corresponding to the relationship set into the entity set with the N cardinality ratio.
- Then we adjust the foreign primary constraint if necessary.
- In 1:1 relationship sets, either side may serve as the "many" side; however, choose the side with the most participation. Otherwise, NULL values may be present in any of the relation's tuples.