ER MODEL TO RELATIONAL SCHEMA MAPPING

STEP 1: MAPPING THE STRONG ENTITIES

RULES:

* For each regular (strong) entity type E in the ER schema, create a relation R that includes all the simple attributes of E while including only the simple component attributes of a composite attribute if any.
* Choose one of the key attributes of E as the primary key for R.
* The foreign key and relationship attributes, if any, are not included in this step.

We create the relations DEPARTMENT, COURSE, STAFF MEMBER and STUDENT in the relational schema to correspond to the regular entity types of DEPARTMENT, COURSES, STAFF MEMBER and STUDENT in the ER diagram.

STEP 2: MAPPING OF BINARY 1:1 RELATIONSHIP TYPES

RULES:

* For each binary 1:1 relationship type R in the ER schema, identify the relations S and T that correspond to the entity types participating in R.
* Choose one of the relations—S, and include as a foreign key in S the primary key of T. Choose an entity type with totalparticipation in Rfor the role of S.

We map the 1:1 relationship type MANAGEMENT from the ER DIAGRAM by choosing the participating entity type DEPARTMENT to serve in the role of S because its participation in the relationship is total (every department has a manager). We include the primary key of the PROFESSOR relation as foreign key in the DEPARTMENT relation.

STEP 3: MAPPING OF BINARY 1: N RELATIONSHIP TYPES

RULES:

* For each regular binary 1: N relationship type R, identify the relation S that represents the participating entity type at the N-side of the relationship type.
* Include as foreign key in S the primary key of the relation T that represents the other entity type participating in R.

We map the 1: N relationship types WORKING and OFFERS from the ER diagram. For WORKING relationship we include the primary key Department number of the DEPARTMENT relation as foreign key in the STAFF MEMBER relation. For OFFERS we include the primary key of the DEPARTMENT relation as foreign key in the COURSE relation.

STEP 4: MAPPING OF M: N RELATIONSHIP TYPES

RULES:

* For each binary M: N relationship type R, create a new relation S to represent R. Include as foreign key attributes in S the primary keys of the relations that represent the participating entity types; their combination will form the primary key of S.
* For each of the new relations created above, the primary key of them is the combination of the foreign key attributes.

For the M: N relationship of enrolment we include the primary keys of student and courses as foreign keys in enrolment.

For the ternary M: N relationship of teaching we create a relation TEACHING and include the primary keys of professor, teaching assistant and course as the foreign keys of Teaching. We also include the simple attributes of teaching relationship in the teaching relation.

STEP 5: MAPPING OF ISA HIERARCHY

RULES:

* Create a relation for each entity set in the hierarchy
* The attributes of the relation for a non-root entity set E are the attributes forming the key (obtained from the root) and any attributes of E itself.

For the ISA relationship in the ER diagram, we create relations STAFF MEMBER, PROFESSOR and TEACHING ASSISTANT in the relational schema where the latter two relations have the key attribute of STAFF MEMBER (root entity) as their only attribute.

This approach of mapping the ISA hierarchy into relational schema does not add NULL values into the tuples (Flatten approach adds NULLs to the tuples).