

Entity Relationship Diagram Problem

Consider the following database schema for a restaurant.

Ingredient(iid, name, allergen)

Dish(did, name, description, category)

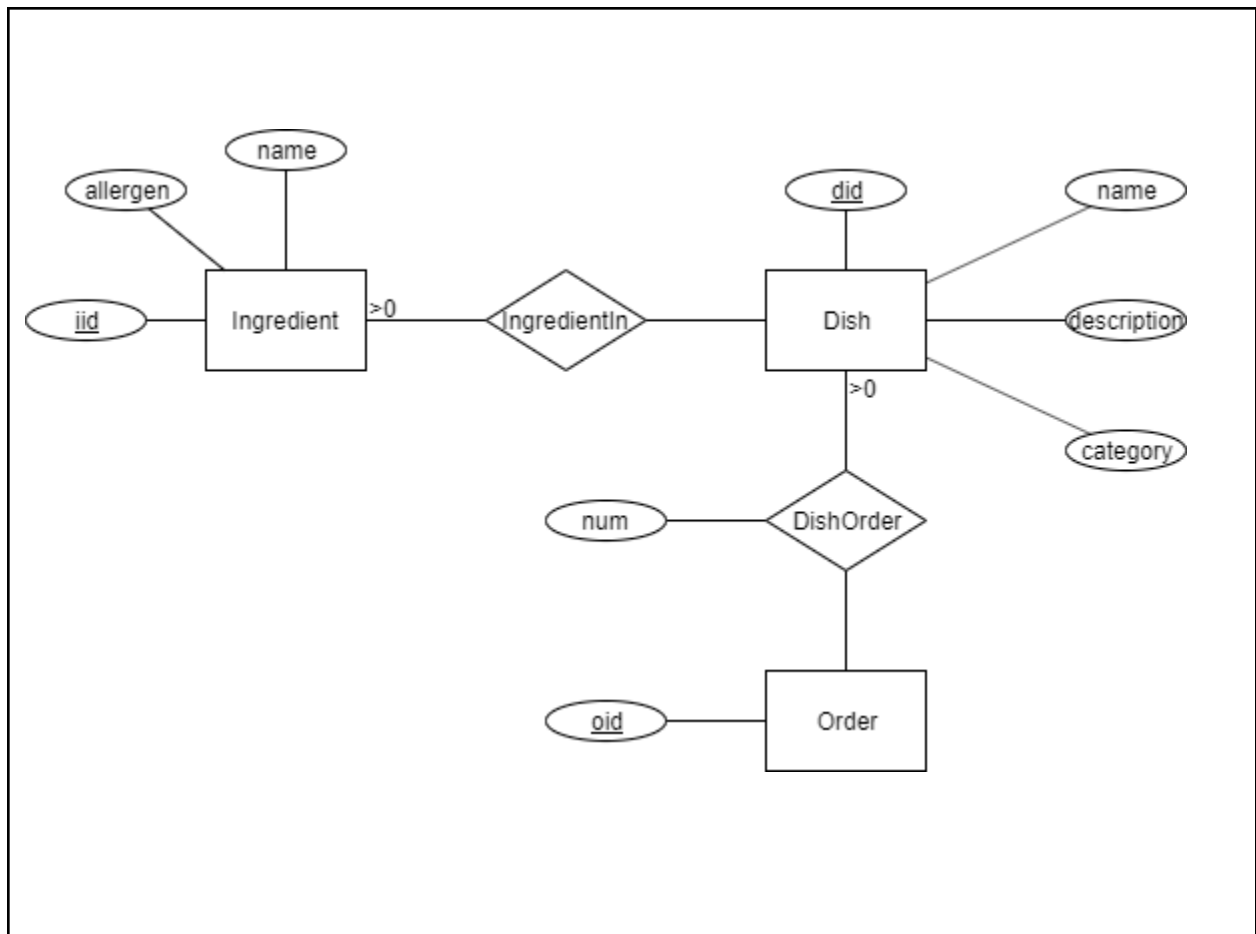
IngredientIn(iid, did)

Order(oid, customer)

DishOrder(oid, did, num)

Draw an E/R diagram to represent the database, with the Ingredient, Dish, and Order tables as the entities, and IngredientIn and DishOrder as the relationships. Make sure to enforce the following constraints:

1. Ingredient.**iid**, Dish.**did**, Order.**oid** are the primary keys of the corresponding tables
2. A Dish should have **at least one** Ingredient.
3. An Order should have **at least one** Dish.



(17WI Final Q4)

Given $R(A, B, C, D, E)$, and functional dependencies: $A \rightarrow C$, $BD \rightarrow A$, $D \rightarrow E$

a) Decompose R into BCNF. In each step, explain which functional dependency you used to decompose and explain why further decomposition is needed. Your answer should consist of a list of table names and attributes. Make sure you indicate the keys for each relation.

One possible decomposition:

1. Use $A \rightarrow C$:

Decompose R into $R_1(A, C)$ and $T(A, B, D, E)$

T violates $BD \rightarrow A$ and $D \rightarrow E$, so we need to further decompose T

2. Use $D \rightarrow E$:

Decompose T into $R_2(B, D, A)$ and $R_3(D, E)$

Final relations: $R_1(\underline{A}, C)$, $R_2(\underline{B, D}, A)$, and $R_3(\underline{D}, E)$