2 Databases (tgg22)

This question develops an Entity-Relationship (ER) model for a new database. The database will be called Meta-ER because it contains Entity-Relationship models! The entities of our ER model are

entity name	description
Model	each Model represents an ER model
Entity	each Entity represents an ER entity
Relationship	each Relationship represents an ER relationship
Attribute	each Attribute represents an attribute

Each of our entities will have an **id** attribute (the primary key) and a **name** attribute. In addition, the Attribute entity will have a **type** attribute indicating the data type of the Attribute:

entity name	attributes
Model	**id**, **name**
Entity	**id**, **name**
Relationship	**id**, **name**
Attribute	**id**, **name**, **type**

(*a*) We start with one many-to-many relationship ModelHasEntity between Model and Entity that indicates which entities belong to the Model. For example, we may have a model called "MoviesModel" related to the entities presented in lecture, or a model "Trucks-R-Us" for a transportation company. ModelHasEntity is many-to-many to allow different models to share entities. Your task now is to complete this ER model and consider implementing it in a relational database.

(*b*) Define a relationship between Entity and Attribute called EntityHasAttribute. What cardinality should this relationship have? Justify your answer. [2 marks]

(*c*) Define a relationship between Relationship and Attribute called RelationshipHasAttribute. What cardinality should this relationship have? Justify your answer. [2 marks]

(*d*) Define a relationship called RelationshipRelatesEntity between Relationship and Entity. What cardinality should this relationship have? Justify your answer. [2 marks]

(*e*) Should the relationship RelationshipRelatesEntity itself have attributes? Justify your answer. Let us assume that all of our relationships are binary. [2 marks]

(*f*) Describe a relational implementation of your ER model, including keys and foreign keys. [4 marks]

(*g*) Given your relational implementation, write an SQL query that takes a model name `mname` and returns all triples `ename1`, `rname`, `ename2` where `ename1` and `ename2` are names of entities in the model `mname`, and `ename1` is related to `ename2` via the relationship with name `rname`. [8 marks]