Database Design I

A hiking association wishes to design a database to manage its activities.

- The association has several offices. Each office is identified by its name and characterized by the city in which it is located, the address, the phone number and the website. Each office organizes hikes. For each hike, an identification code, the organizing office, the name of the resort where it is held, a short description and the duration (in hours) are known. Hikes are divided into trekking hikes and climbing hikes. For trekking hikes, the database stores the difficulty level of the path and the information whether the hike includes an overnight stay. For climbing hikes, the type of wall (e.g., cliff or ice) and the adopted climbing technique are known.
- Some hikes require the use of special equipment such as ropes, stakes or climbing shoes. Each piece of equipment is identified by a unique code and characterized by the name and the size, if any. For each hike, the list of the (possibly) required equipment is known. For each association office, the pieces of equipment available for rent in the office, along with the rental fee, are known.
- Hikes are accompanied by professional guides. Guides are characterized by their social security number (SSN), name, cell phone number and the list of their qualifications. For each guide, we want to keep track of each hiking accompanied by that guide in each date, together with the start time and the end time of the hike. Please consider that the same guide may accompany several different hikes, or she may accompany the same hike more than once, but she may not accompany two or more hikes at the same time.
- The offices of the association offer additional facilities (e.g., infirmary or artificial climbing walls). Each facility, identified by a unique code within the office providing it, is characterized by its name, the type of facility (e.g., medical or sporting) and the information whether the facility is provided for free or not. The database also stores the days of the week on which each facility is open, along with its opening and closing times. Assume that each facility is open during at most a single time frame on the same day.

(a) *Mandatory* exercise (9 points): Describe the conceptual schema of a database for the above application by means of an ER diagram.

(b) *Mandatory* exercise (4 points): Derive a normalized relational logical schema for the same database.

(c) *Optional* exercise (1 point): Define referential integrity constraints for 3 relations of your choice among those defined in the conceptual schema.