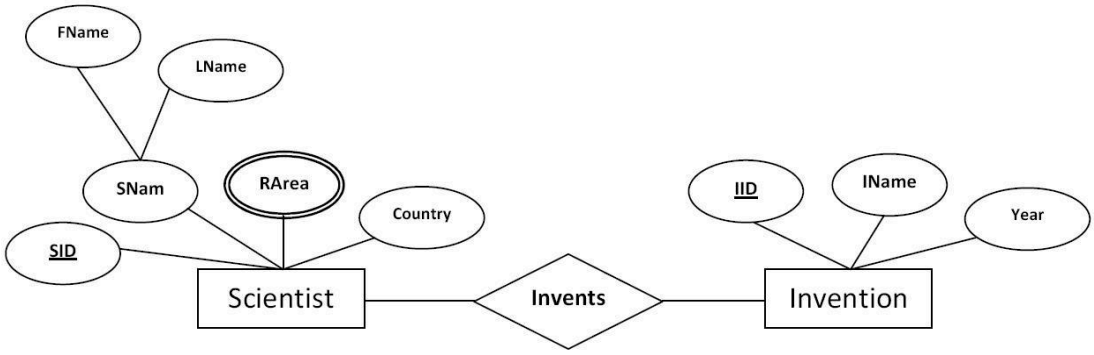
1. Consider the following information about a **university database.**
    - Professors have a SSN, a name, an age, a rank, and a research specialty.
    - Projects have a project number, a sponsor name (e.g. UNDP), a starting date, an ending date, and a budget.
    - Graduate students have a SSN, a name, an age, and a degree program (e.g., M.S. or Ph.D.).
    - Each project is managed by one professor (known as the project's principal investigator).
    - Each project is worked on by one or more professors (known as the project's co-investigators).
    - Professors can manage and/or work on multiple projects.
    - Each project is worked on by one or more graduate students (known as the project's research assistants).
    - When graduate students work on a project, a professor must supervise their work on the project. Graduate students can work on multiple projects, in which case they will have a (potentially different) supervisor for each one.
    - Departments have a department number(unique) , a department name, and a main office.
    - Departments have a professor (known as the chairman) who runs the department.
    - Professors work in one or more departments, and for each department that they work in, a time percentage is associated with their job.
    - Graduate students have one major department in which they are working on their degree.
    - Each graduate student has another, more senior graduate student (known as a student advisor) who advises him or her on what courses to take.

    Draw an Entity-Relationship (ER) diagram to represent data requirements described above.

2. **Consider the following information about a National Hockey League database.** Suppose you are given the following requirements for a simple database for the National Hockey League (NHL):
    - the NHL has many teams,
    - each team has a name, a city, a coach, a captain, and a set of players,
    - each player belongs to only one team,
    - each player has a name, a position (such as left wing or goalie), a skill level, and a set of injury records,
    - a team captain is also a player,
    - a game is played between two teams (referred to as host_team and guest_team) and has a date (such as May 11th, 1999) and a score (such as 4 to 2).

    Draw an Entity-Relationship (ER) diagram to represent data requirements described above. List your assumptions and clearly indicate the cardinality mappings as well as any role indicators in your ER diagram.

3. Reduce the ER diagram in figure-1 to relational schema. Show the resulting schema diagram. Add justifications where necessary.



4. Check whether the given schedule S is view serializable or not-

T1	T2	T3	T4
R (A)			
	R (A)		
		R (A)	
			R (A)
W (B)			
	W (B)		
		W (B)	
			W (B)

5. Check whether the given schedule S is **view serializable** or not. If yes, then give the serial schedule.

   S : R1(A) , W2(A) , R3(A) , W1(A) , W3(A)

6. Construct a B+ tree index structure with n = 4, and incrementally inserting the search keys 90, 80, 70, 60, 50, 40, 30, 20.