CSCI 585 DATABASE SYSTEMS ASSIGNMENT 1

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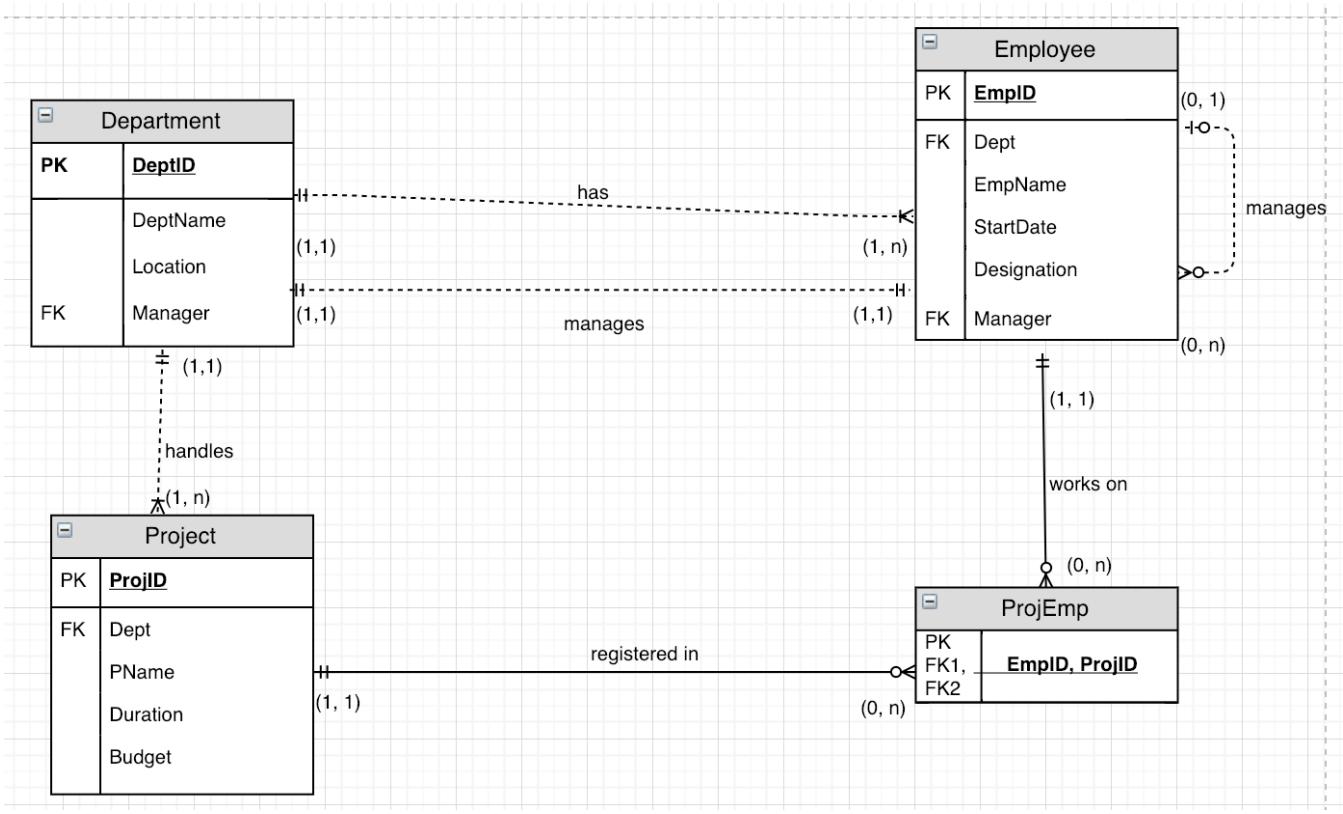
NOTE: All questions are solved using draw.io for the bonus question.

Q1 [2 points]. Draw an ER diagram to model the following scenario. A biotech company contains several departments (eg. R&D, Licensing, Sales...) each of which is in-charge of several projects. There are no projects that are shared between departments. Each employee of the company belongs to a single department, and can possibly work on multiple projects. Each project could have multiple employees. A department has one or more employees (and is in-charge of one or more projects as noted earlier). Some employees are managers, who supervise multiple employees; each employee is supervised by atmost one manager. Some employees are also department managers (they don't manage people), each department has a single manager.

We need to store employees' names and start dates, departments' names and locations, and projects' names and durations. Also, we need to store the hours that employees spend on projects they're on.

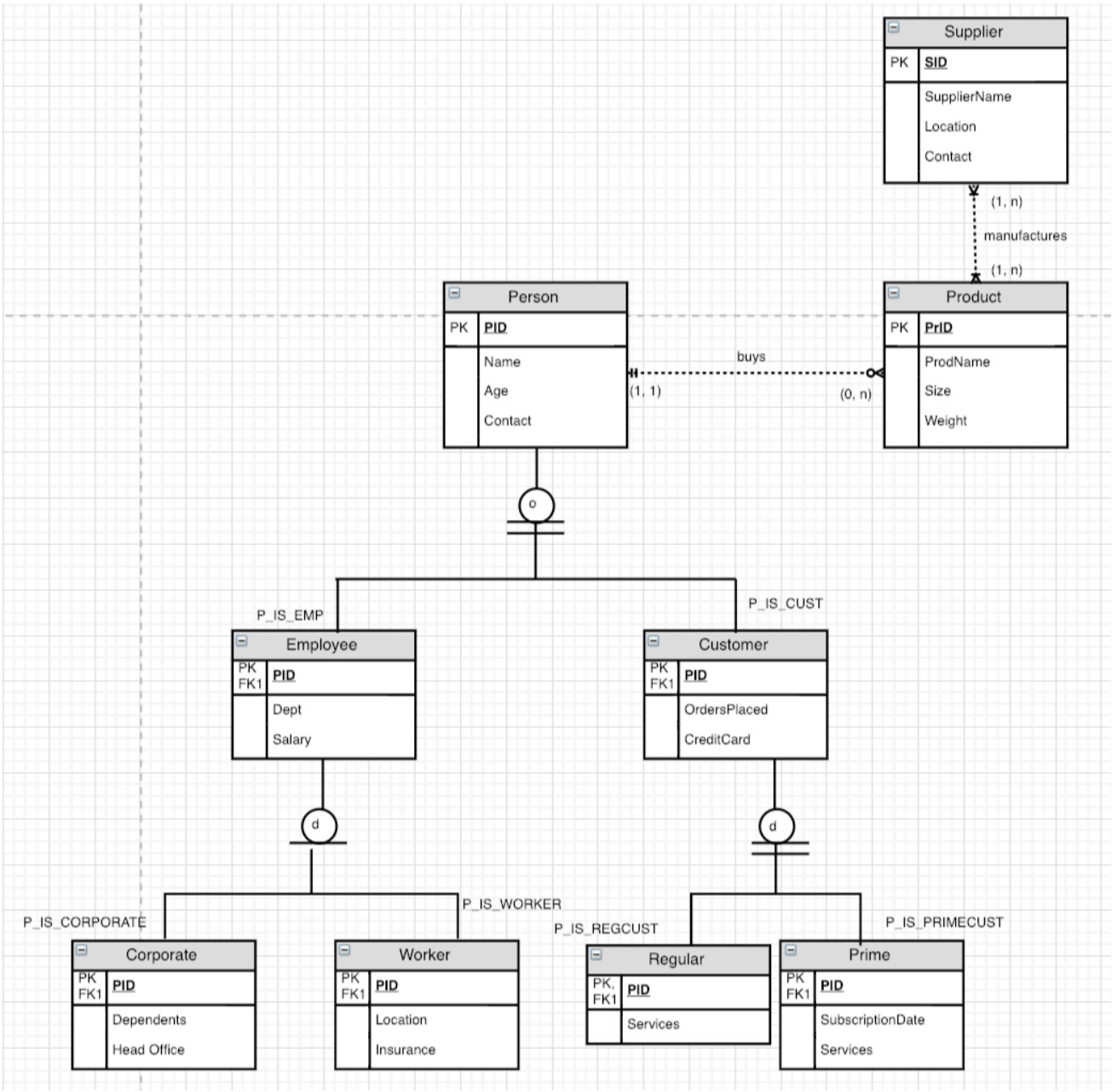
In the diagram, indicate connectivities of the form a..b [assume that 'multiple' above is 0..N].



Q2 [2 points]. Draw an EER diagram, to model a domain of your choice - ANY domain! The diagram needs to show at least one supertype/subtype hierarchy, with appropriate notations

for disjointness constraint and completeness constraint. There needs to be at least two other (non subtype/supertype) relationships in the diagram. Overall, there needs to be at least 6 entities in your diagram. Be sure to indicate connectivities.

DOMAIN: E-Commerce. Person can be an employee or customer or both. Customer has to be either a prime or a regular customer. An employee can be a worker, corporate or neither of them (regular employee).



Q3 [0.5 + 0.25 + 0.25 = 1 point]. Consider a ternary relationship between Supplier, Project and Product [with semantics similar to the 'doctor, patient, drug' example from the lecture].

Draw a ternary ER diagram to model the relationship, taking into account, the need to store 'Quantity' and 'Due date' for products supplied to projects by suppliers.

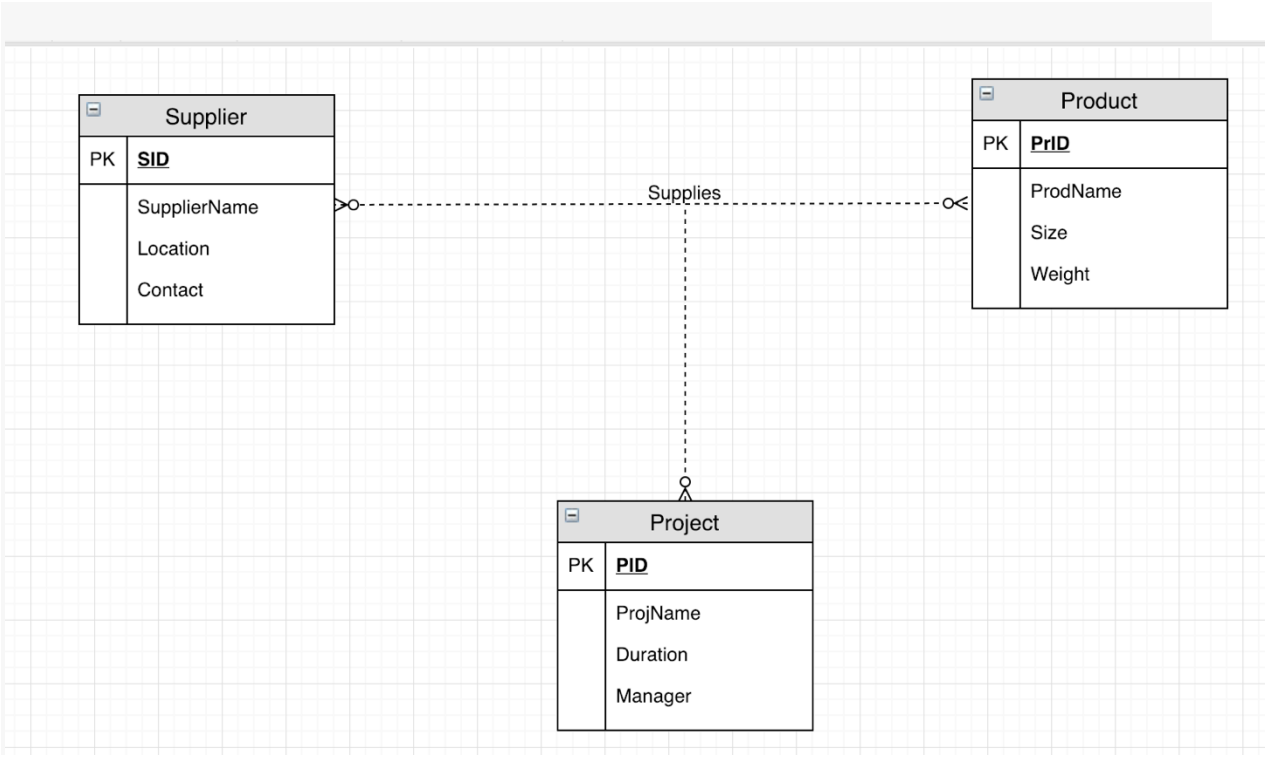


Fig 3: Conceptual model of the ternary relationship.

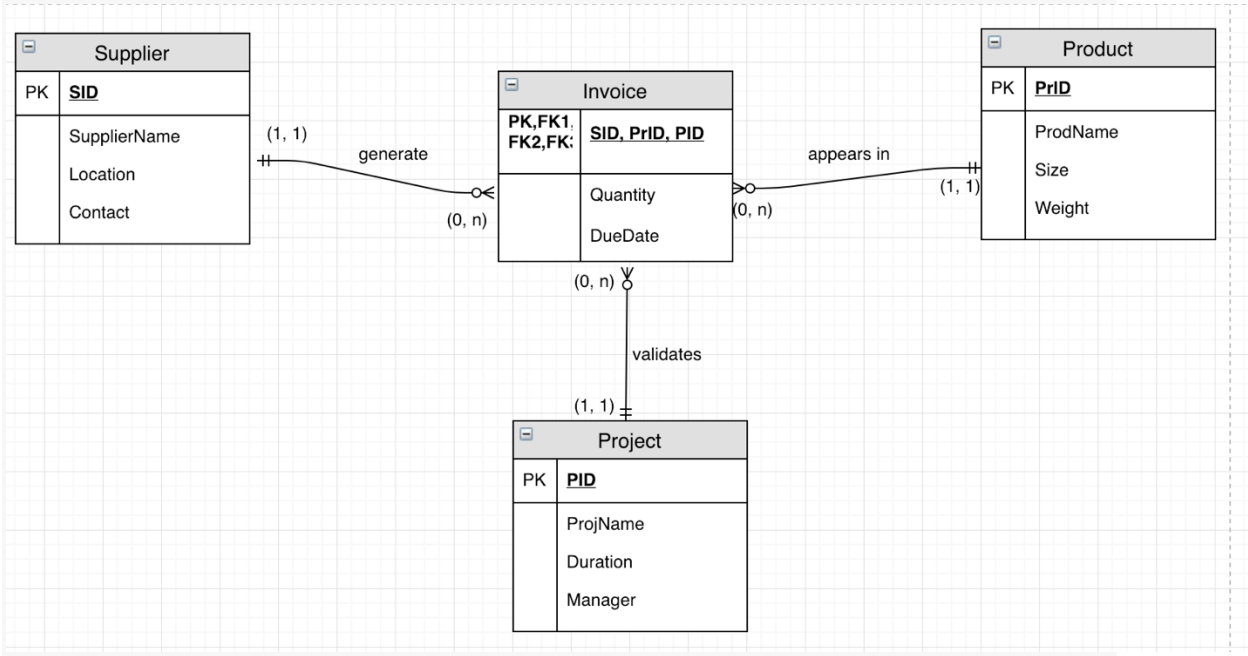


Fig. 4: Logical model of the ternary relationship.

b. Model (with an ER diagram) the same scenario, using binary relationships instead of a ternary one.

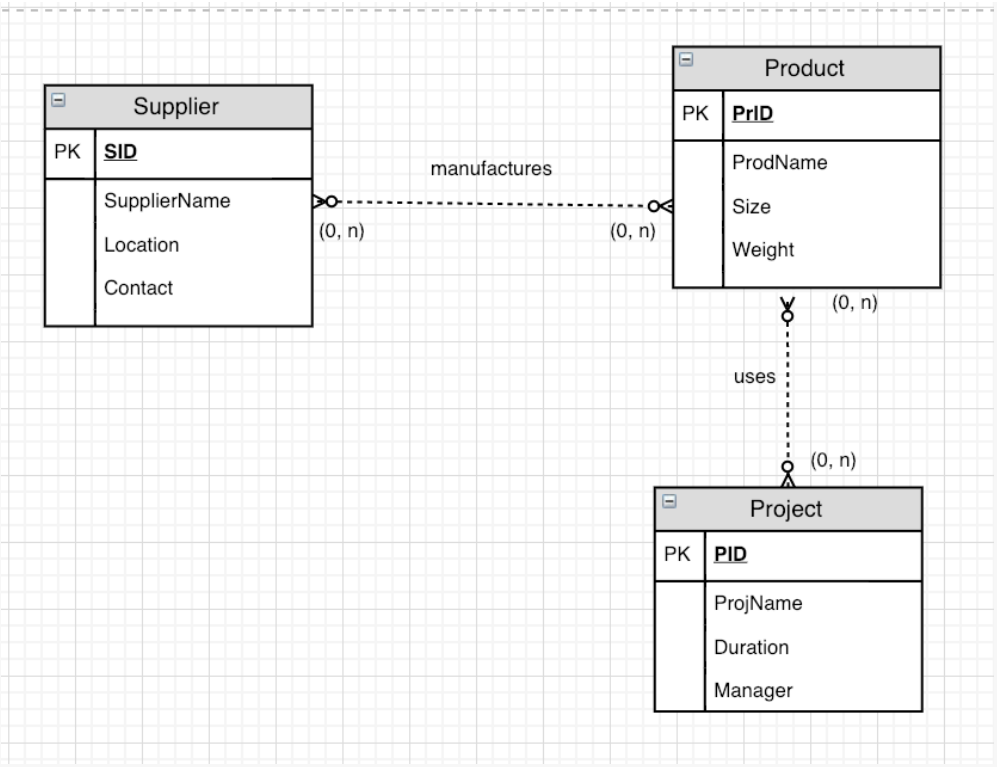


Fig 5: Conceptual model of the binary relationship.

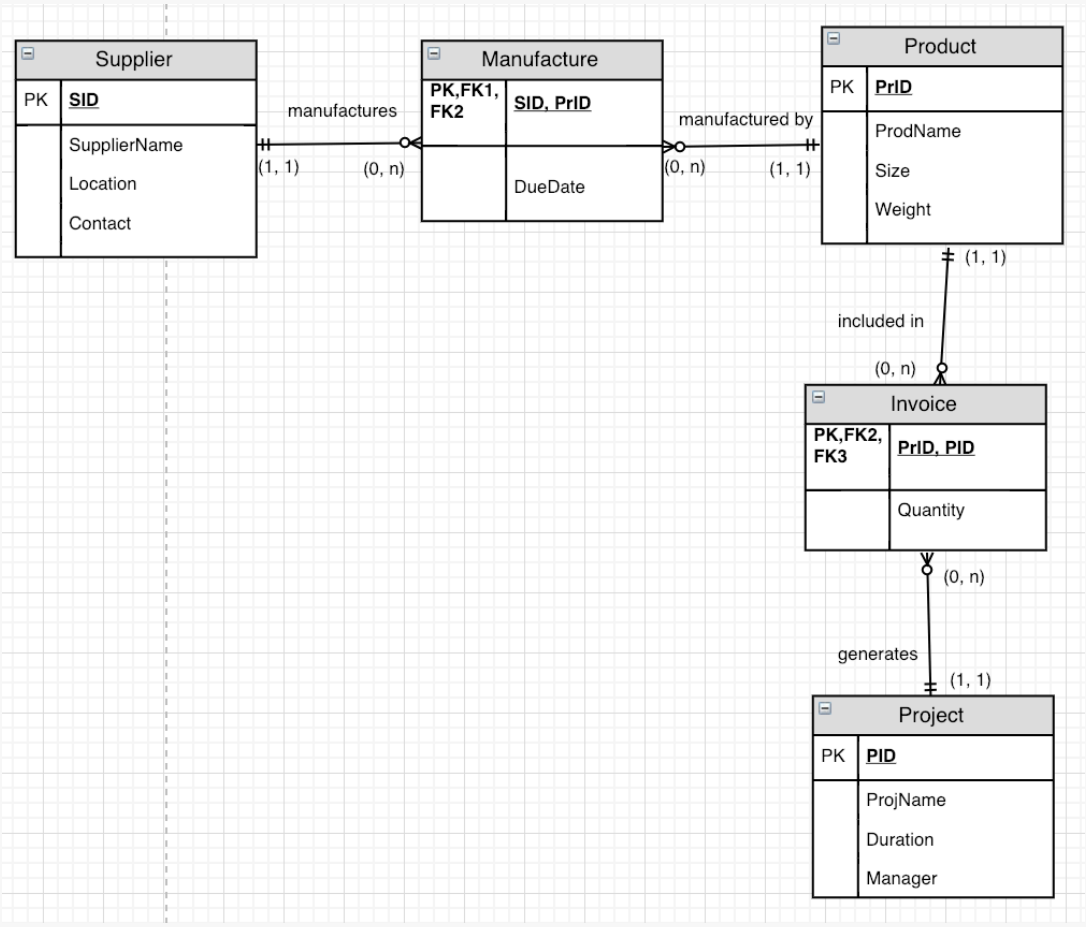


Fig 6: Logical model of the binary relationship.

c. What is lost, in doing b.? Think carefully - create sample tables if you need to!
Sol: There are many possible binary relationships between the relations when a ternary relationship is converted to a binary one. Relationship between Supplier and Project is lost in one of the many possible binary relationships. This leads to loss of information, such as, when a product is used by a project, we store the data in invoice but there is no way to know information about the supplier who manufactured the specific product. In ternary relationship, invoice stored information about the supplier, product and project together thereby preserving this information.

Q4. [1 point]. There exists a ternary relationship between Instructor, CourseSection and Term, when it comes to courses being offered. Also, not all instructors can teach all courses - they need to be qualified. Not all courses are taught all terms. Model this using an ER diagram, again indicating connectivities that can include 0 as a lower bound (like in Q1).

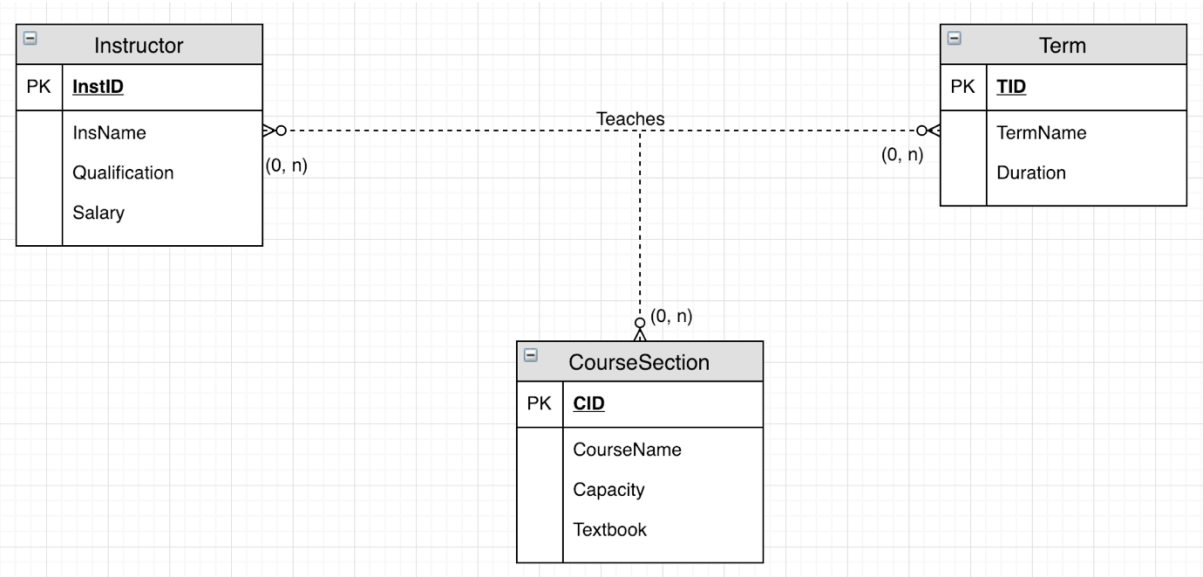


Fig. 7: Conceptual model of the Instructor, Term, CourseSection relationship.

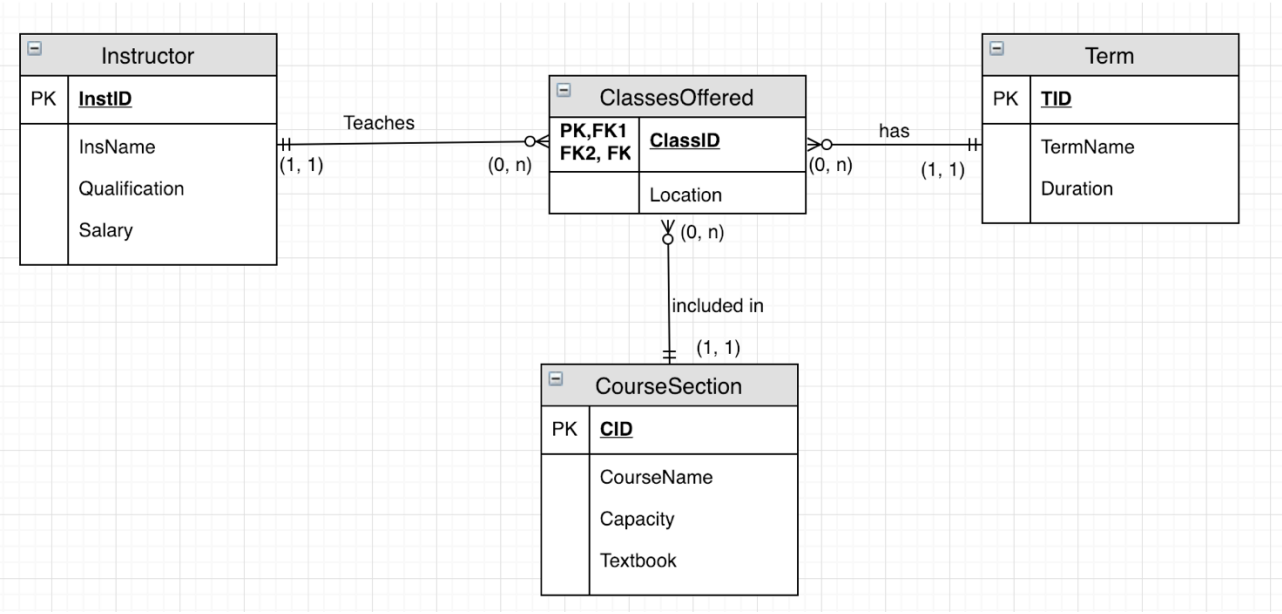


Fig. 8: Logical model of the Instructor, Term, CourseSection relationship.