Lab 5 Solutions

CS 355 Database Systems
Habib University
Fall 2022

1 Exercises

The ERD Diagram for the Company Database is as follows:

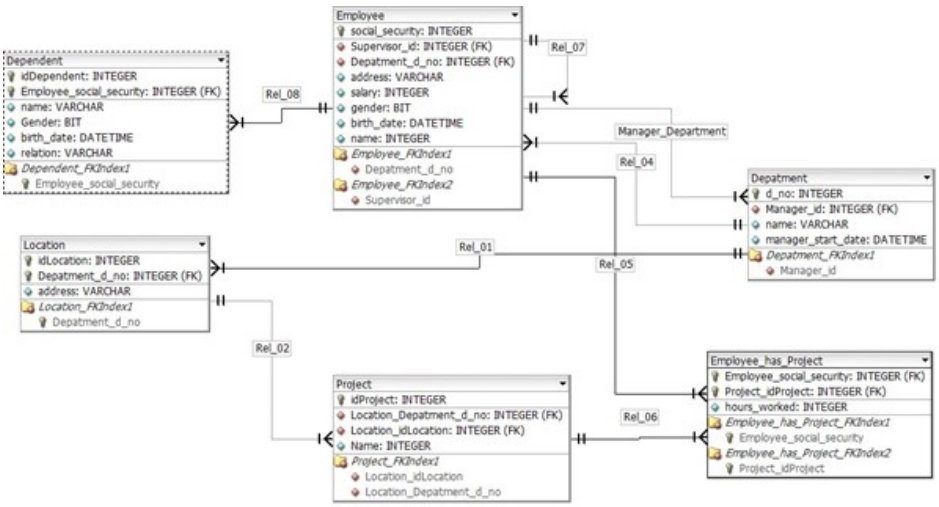

Figure 1: Company Database ERD

The following are the assumptions that are taken:

- A single department controls a project.
- Any employee from any department can join a project and each project's working hours are recorded separately.
- A department can have multiple locations.
- A project will always have a single location.

1. List all information for all male employees.

$$\sigma_{gender=M}(Employee)$$

2. List all employees which are born after the date 31/12/1985.

$$\sigma_{birth\_date>\text{“}31/12/1985''}(Employee)$$

3. List all employees who are female and earn more than 80000.

$$\sigma_{gender=F \wedge salary>80000}(Employee)$$

4. Andrew Stewart is a new employee at the company, list all the possible projects that Andrew can work on. (Result: Employee Name (Andrew Stewart), Project id, Project Name)

$$\pi_{Employee\_name,Project\_id,Project\_name}(\sigma_{Employee\_name=\text{“}AndrewStewart''}(Employee \times Project))$$

5. Find all possible combinations of department and project.

$$Department \times Project$$

6. List all employees that are working on the project “Razor 1” as well as those employees who are not assigned to any project. (Result: Social Security Number, Project Name)

$$\begin{aligned}&\pi_{Social\_security\_no,Project\_Name}\\&\sigma_{Project\_Name=Razor1 \vee Project\_Name=NULL}\\&(Employee \rtimes_{social\_security=Employee\_social\_security}\\&(Employee\_Has\_Project \bowtie_{idProject=Project\_idProject} Project))\end{aligned}$$

7. List all projects and the departments that are controlling the project. (Result: Project Id, Department Id)

$$\pi_{Project\_id,Department\_id}(Project \bowtie_{Project.d\_no=Department.d\_no} Department)$$

8. Search for Employees which have no dependents.

$$a := \pi_{social\_security}(Employee \bowtie_{social\_security=Employee\_social\_security} Dependent)$$

$$b := \pi_{social\_security}(Employee)$$

$$a - b$$

9. List the following information; Department Name, Manager Name, Manager Start Date

$$\pi_{Department\_name,Manager\_name,Manager\_start\_date}(Department \bowtie_{Department\_d\_no=d\_no} Employee)$$

10. List all departments with their locations

$$\pi_{Department,Location}(\sigma_{Department.d\_id=Location.d\_id}(Department \times Location))$$

11. Project "Alpha" and Project "Beta" have multiple employees working on them, some of the employees are working on both projects. Find all employees that are only working on either Project "Alpha" or Project "Beta".

$$a = \sigma_{Project\_Name=Alpha}(Employee\_Has\_Project \bowtie Project)$$

$$b = \sigma_{Project\_Name=Beta}(Employee\_Has\_Project \bowtie Project)$$

$$\pi_{Employee\_ID}((a \cup b) - (a \cap b))$$