1. Consider the following information: (all written on paper)
   - An *Employee* could be only one of these: a *Manager*, *Hourly Employee* or *Regular Employee*.
   - All kinds of employees have the following information: SSN, Name, Address, City, Date of birth, Number of dependents, Date of Employment.
   - A *Manager* has the following additional information: Number of Employees, Number of years in Department, Salary, and Number of rewards.
   - An *Hourly Employee* has the following additional information: Hourly rate, and Number of hours per week.
   - A *Regular Employee* has the following additional information: Manager SSN, Salary.
   - All *Employees* (all kinds) has *Skills (could be many skills where a skill could belong to many).*
   - A *Skill* is recorded as the following: Skill ID, Skill name, Skill specs
   - One manager can manage only one *Department* where the number of management years should be recorded.
   - *Regular Employees* work at exactly one department that could have many regular employees.
   - *Hourly employees* can work in many departments that could have many hourly employees.
   - A *Department* could be responsible of running many other *Departments* (could be run by only one)
   - A *Department* has the following information: Name, number, and Number of employees.
   - A *Manager* makes *reports*. A report should be made by one manager.
   - A *Report* has the following information: Number, Date, Type, and Title.

. Draw the **Full** (entities, relationships, attributes) **EER diagram**. (10 points)
. Translate this EER diagram into a **relational database** by defining all the needed relations and the **referential integrities** between relations for such database. (10 points)
. Write the SQL code for Report and Department tables stating the **primary key**, foreign key and **referential integrity (if there is).** (10 points)
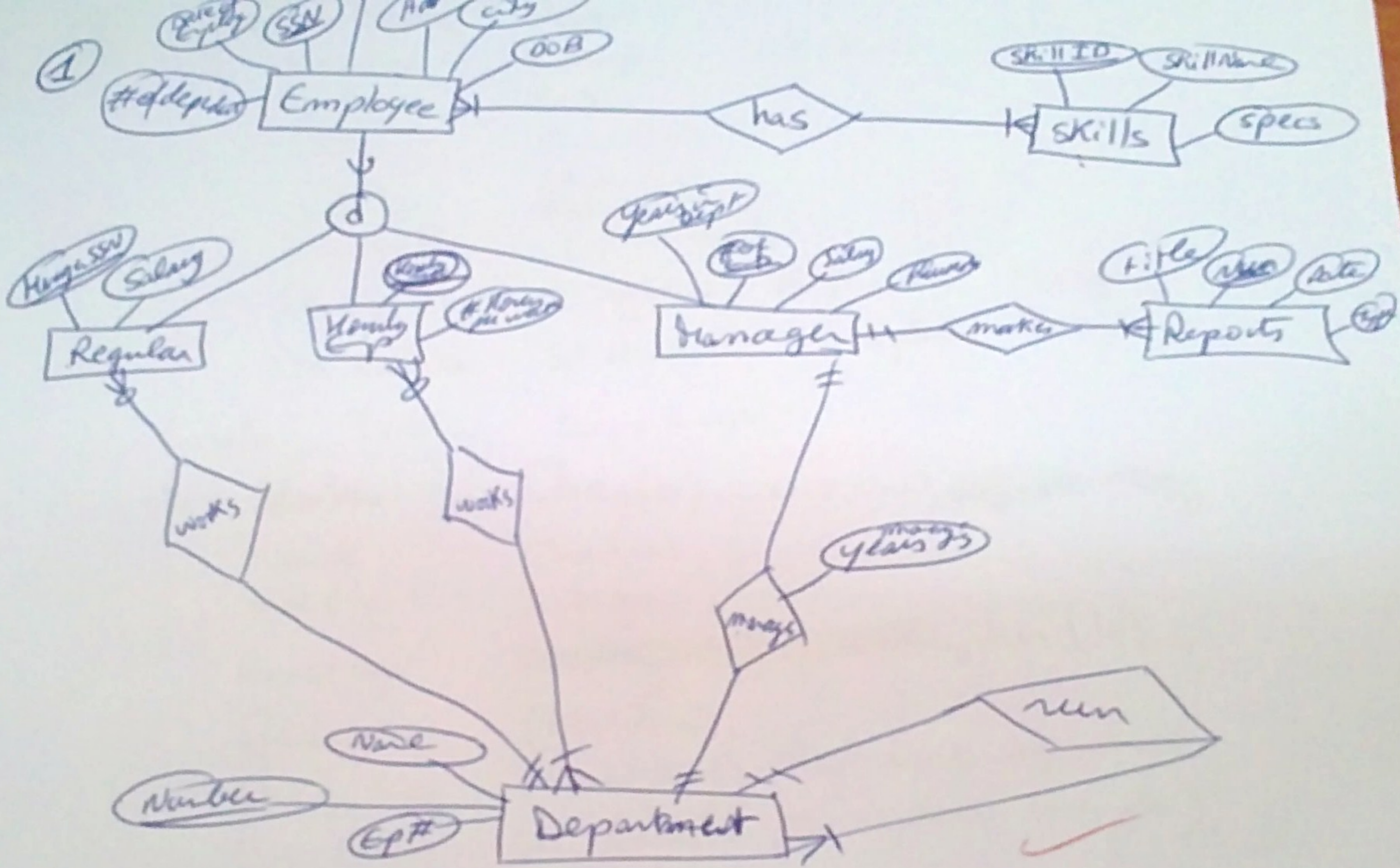. Use SQL to insert a record in Department. Choose any values to insert (10 points)
. Write the SQL code for deleting Department d5 from the department table (10 points)
. Write the SQL for increasing 10% for all hourly rates for hourly employees that work more than 25 hours a week (10 points)
. For each of the following queries, write the SQL code (30 points/ 5 each)
   1. Show the title, date and type of the reports who done on 2/2/2007.
   2. Show all reports done by manager "john smith"
   3. show all the manager that have the typing skill
   4. For each dept show the dept number and the number of regular employees working at.
   5. How many hourly employees work in Department D2?
   6. What the sum of hours worked by hourly employee with SSN=1122334455?
   7. Show info of all employees that live in an address that include the string "123 summit ave" in it (could be beginning, middle or end)

. Write the **Algebra** and **calculus** for the first 3 queries (15 point)

①

Employee — has — Skills
Attributes on Employee: SSN, Name, City, DOB, #of depend
Skills attributes: Skill ID, Skill Name, specs

(d) subclass:
Regular — attributes: Manager SSN, Salary
Hourly — # hours per week
Manager — attributes: year dept, Job, City, Phone

Manager — marks — Reports
Reports attributes: title, value, date

Regular — works — Department
Hourly — works — Department
Manager — manages — Department (years as manager)

Department — run
Department attributes: Name, Number, Ep#

② Employee (SSN, Name, DOB, Address, City, Date of Emp, # of Dependents)

Regular (SSN, ManagerSSN, Salary, DNO)

Hourly (SSN ...

Number
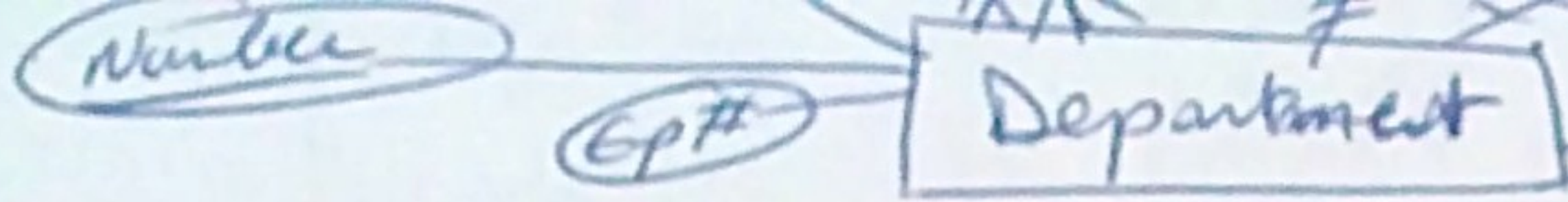
Ep# Department

(2) Employee (SSN, Name, DOB, Address, City, Date of Emp, #of Dependents)

Regular (SSN, ManagerSSN, Salary, DNO)

Hourly (SSN, HourlyRate, #of Hours per week)

Manager (SSN, #of Emp, years=dept, Salary, Rewards, DeptNo, Managing years)

Reports (Number, Date, Title, type, MgSSN)

Department (Number, Name, #of Emp, OwnedDept)

WorksIn (Manly SSN, Dnumber)

Skills (Skill ID, SkillName, Skill specs)

IsSkillfulIn (Skill ID, SSN)

③ Create Table Report
(Rnumber   Integer   Not Null,
  Date   Date,
  Title   Char (10),
  Type   Char (10),
  MgSSN   Varchar (9),
  Primary Key   (Rnumber),
  Foreign Key   (MgSSN) References Manager,
  On Delete Set Null   On Update Cascade);

Create Table Department
(Number   Char(10) Not Null, ~~default~~
   Name   Char(10),
   #of Emp   Integer,
   Runned Dept ~~Integer Default~~ Char (10),
   Primary Key   (Number),
   Foreign Key   (Runned Dept) References Department
   On delete set Null, On Update Cascade);

④ Insert Into Department

④ Insert Into Department
Values (4, `Advatising`, 5, `0`); —

⑤ Delete From Departmet where Number = `d5`;

⑥ Update Hourly
Set Hourly Rate = 1.1 * HourlyRate
where #of Hours per Week > 25

⑦ 1) select R.tillegDate S.Type
from Reports As R
where R.Date = `2/2/2007`;

2) select R.*
from Reports R, ~~Employee~~ E
where R.MgSSN = E.SSN AND E.name = "john smith";

3) select M.*
from Manager As M, IsSkillfue In I, Skills as S
where M.SSN = I.SSN AND I.SkillID = S.SkillID~~Fw~~ AND skillnae = "Typist"

4) Select D.Number, Count(*) As Number of Regular Employees
   from Department D, Regular
   where D.Number = Regular.DNO.
   Group By D.Number;

5) Select Count(*) As Hourly_Emp# in D2
   from Department Works In
   where Dnumber = "D2";

7) Selat *
   from Employee
   where Address Like "%123 summit ave %";

6) Select SUM (Hours per Week)
   From Hourly, Works In

8) 1) $\pi_{R.title, R.date, R.type} \left(\sigma_{R.date = 2/2/2007} (Report) \right)$

$\{R.title, R.date, R.type \mid Report(R) \text{ AND } R.date = 2/2/2007\}$

2) $\pi_{R.*} \left(\sigma_{E.name = "John Smith"} \atop{Report(R)} \left(Employee \underset{SSN = begSSN}{\bowtie} Reports \right) \right)$

⟳ $\{R.* \mid Employee(E) \text{ AND } (\exists R)(Reports(R) \text{ AND } R.begSSN = E.SSN$
$\text{AND } E.name = "John Smith")\}$

3) $\pi_{M.*} \left(Manager \underset{M.SSN = I.SSN}{\bowtie} IsSkillfulIn \underset{I.SkillID = S.SkillID}{\bowtie} \sigma_{skillname = typing} (Skills) \right)$

$\{M.* \mid Manager(M) \text{ AND } (\exists I)(IsSkillfulIn(I) \text{ AND } M.SSN = I.SSN$
$\text{AND } (\exists s)(Skills(S) \text{ AND } I.SkillID = S.SkillID$
$\text{AND } skill-name = "typing"))\}$