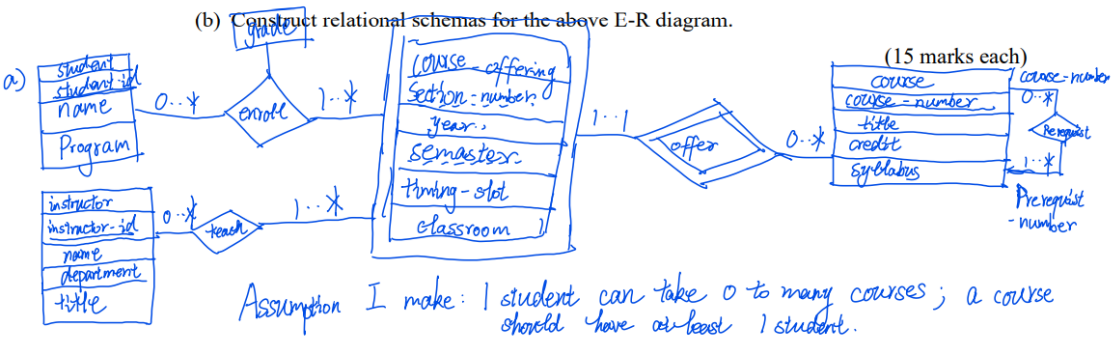
(b) Construct relational schemas for the above E-R diagram. (15 marks each)

a)



Assumption I make: 1 student can take 0 to many courses; a course should have at least 1 student.

2. An instructor can teach 0 to many courses; a course should have at least one instructor.

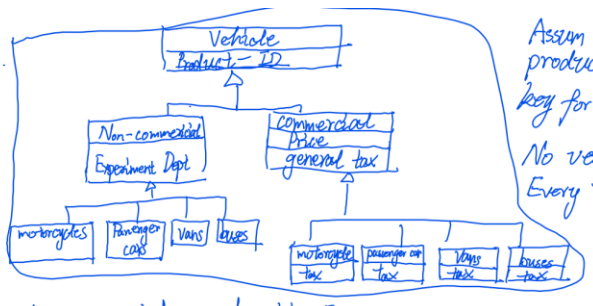
3. one course may have none prequist; one course may be the prerequist course of many courses.

b) student (student-id, name, program)
instructor (instructor-id, name, department, title)
course-offering (course number, section number, year, semester)
course (course number, title, credit, syllabus)
enroll (student-id, course number, section number, year, semester, grade)
teach (instructor-id, course number, section number, year, semester)
offer (cours-number, section-number)
prerequist (course-number, prerequist course number)

2) the col in course — course-number & department
the col in section — course-number
the col in prerequist — course-number & prerequist number.

b) delete prerequist, add one new col prerequist in course

3.



Non-commercial car has its Experiment Department.

Assum all products have an ID called product-ID, and that ID is the primary key for all product.

No vehicle can be both commercial & non-comercial

Every vehicle can be one kind of vehicle (motorcycle passenger car, vans, buses)

commercial car has its general tax & price. Each type of commercial car has its special tax

4. Retrieve the name and address of all employees who work for the "Research" department.

$\pi_{name, address}(\sigma_{department = "Research"}(employees))$

5. For every project located in 'Stafford', list the project number, the controlling department manager's last name, address, and birth date.

$\pi_{project\ number}(\sigma_{project\_loc = "stafford"}(PROJECT))$

$\pi_{Lname, Address, Bdate}\left(\sigma_{mgr\_ssn = \{\pi_{Mgr\_ssn}[\sigma_{Dnumber = \pi_{Dno}(\sigma_{project\_loc = "stafford"}(PROJECT))}(DEPARTMENT)]\}}(EMPLOYEE)\right)$

6. Make a list of project numbers for projects that involve an employee whose last name is "Smith", either as a worker or as a manager of the department that controls the project.

$\pi_{project\ number}[\sigma_{Dno = \pi_{Dno}(\sigma_{Lname = "smith"}(EMPLOYEE))}(PROJECT)]$

7. Retrieve the names of employees who have no dependents.

$\pi_{Fname, Minit, Lname}\{\sigma_{SSN = [\pi_{Ssn}(EMPLOYEE) - \pi_{Essn}(DEPENDENT)]}(EMPLOYEE)\}$

8. List the names of managers who have at least one dependent.

$\pi_{Fname, Minit, Lname}\left(\sigma_{Ssn = \{[\sigma_{Essn = Mgr\_ssn}(DEPARTMENT)](DEPENDENT)\}}(EMPLOYEE)\right)$

9. Find all employees directly supervised by "James Borg".

$\sigma_{Super\_ssn = \pi_{Ssn}[\sigma_{name = "James\ Borg"}(EMPLOYEE)]}(EMPLOYEE)$

10. Find all employees directly supervised by those directly supervised by "James Borg". Would it be possible to find all employees supervised by a given employee at all levels?

$\sigma_{Super\_ssn = \pi_{Ssn}\{\sigma_{Super\_ssn = \pi_{Ssn}[\sigma_{name = "James\ Borg"}(EMPLOYEE)](EMPLOYEE)\}(EMPLOYEE)}$

It is possible.