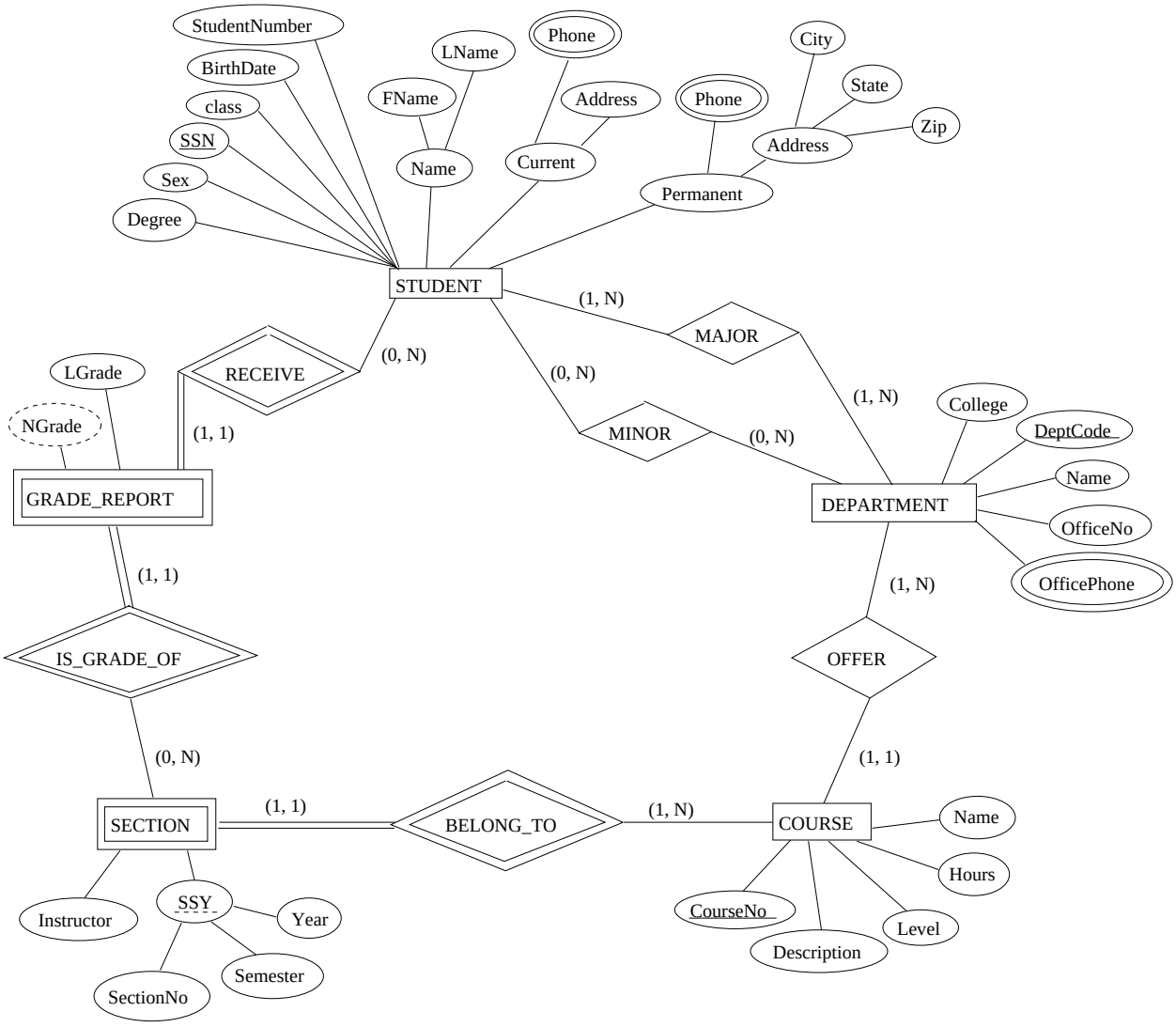
Homework 1 (60 points), Spring 2007

Exercise 3.16 (20 points)



Assumptions:

- **Attributes:**
  - Name of STUDENT is a composite attribute with two simple components - FName, LName.
  - Current (means current address and phone) of STUDENT is a composite attribute with one simple component - Address, and one multivalued component - Phone.

I assume that a student can have only one current address, but possibly multiple current phones.

- Permanent (means permanent address and phone) of STUDENT is a composite attribute with one multivalued component - Phone, and a composite component - Address, which in turn has three simple components - City, State, Zip. I assume that a student can have only one permanent address, but possibly multiple permanent phones.
- OfficePhone of DEPARTMENT is a multivalued attribute. I assume that a department may have multiple phones.
- NGrade of GRADE_REPORT is a derived attribute. I assume that numeric grades can be derived from letter grades.
- SSY of SECTION is a composite attribute with three simple components - SectionNo, Semester, Year. I create this composite attribute to serve as a partial key of weak entity type SECTION.

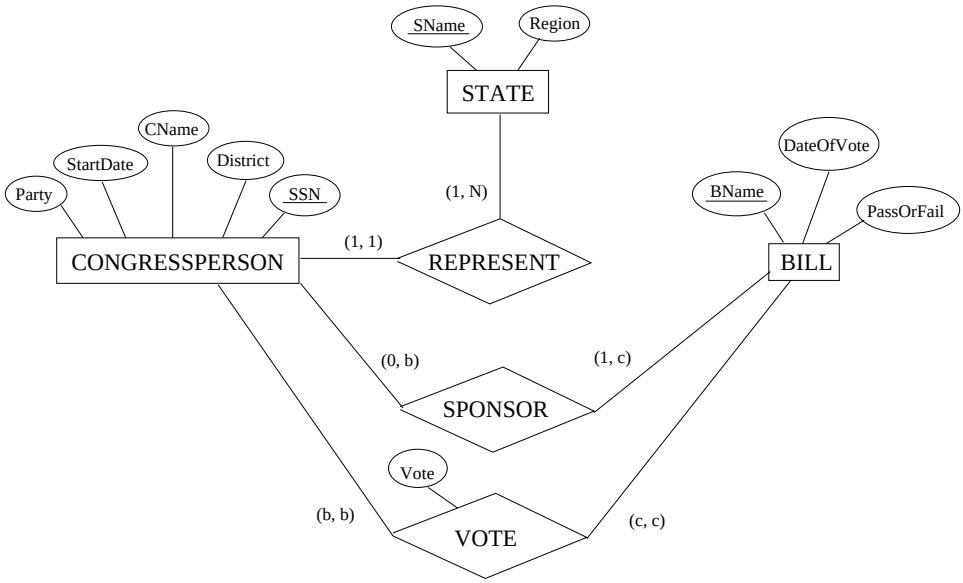
- **Relationship Types:**
  - RECEIVE: I assume that a student may complete 0 to N sections. Therefore, he/she will receive 0 to N grade reports.
  - IS_GRADE_OF: I assume that a section may appear in 0 to N grade reports since it is possible that there is no student completing a particular section.
  - BELONG_TO: Each section should belong to a course and a course should have at least one section.
  - OFFER: A course is offered by exact one department and a department should offer at least one course.
  - MAJOR: A student should claim at least one department as his/her major and a department should have at least one student majoring in.
  - MINOR: A student does not necessary claim any department as his/her minor. A department can have none or many students minoring in. Also, a student can claim several departments as his/her minors at the same time.

- **Weak Entity Types:**
  - SECTION: COURSE is its owner entity type. Therefore, the key attribute CourseNo of COURSE along with the partial key SSY of SECTION together can uniquely identify entities in SECTION.
  - GRADE_REPORT: STUDENT and SECTION are its two owner entity types. Therefore, SSN of STUDENT and SSY of SECTION and CourseNO of COURSE together can uniquely identify entities in GRADE_REPORT.

Exercise 3.17 (10 points)

{PreviousCollege (CollegeName, StartDate, EndDate, {Degree (DegreeName, Month, Year)}, {Transcript (CourseName, Semester, Year, Grade)})}

Exercise 3.21 (10 points)



Let b be the number of Bill
Let c be the number of congressperson

Exercise 3.23 - part a, b, d (10 points)

- **a)** List the (nonweak) entity types in the ER diagram.

  There are **BANK, ACCOUNT, LOAN,** and **CUSTOMER** nonweak entity types.

- **b)** Is there a weak entity type? If so, give its name, partial key, and identifying relationship.

  There is a weak entity type - **BANK-BRANCH**.
  Its partial key is **BranchNo**.
  Its identifying relationship is **BRANCHES**

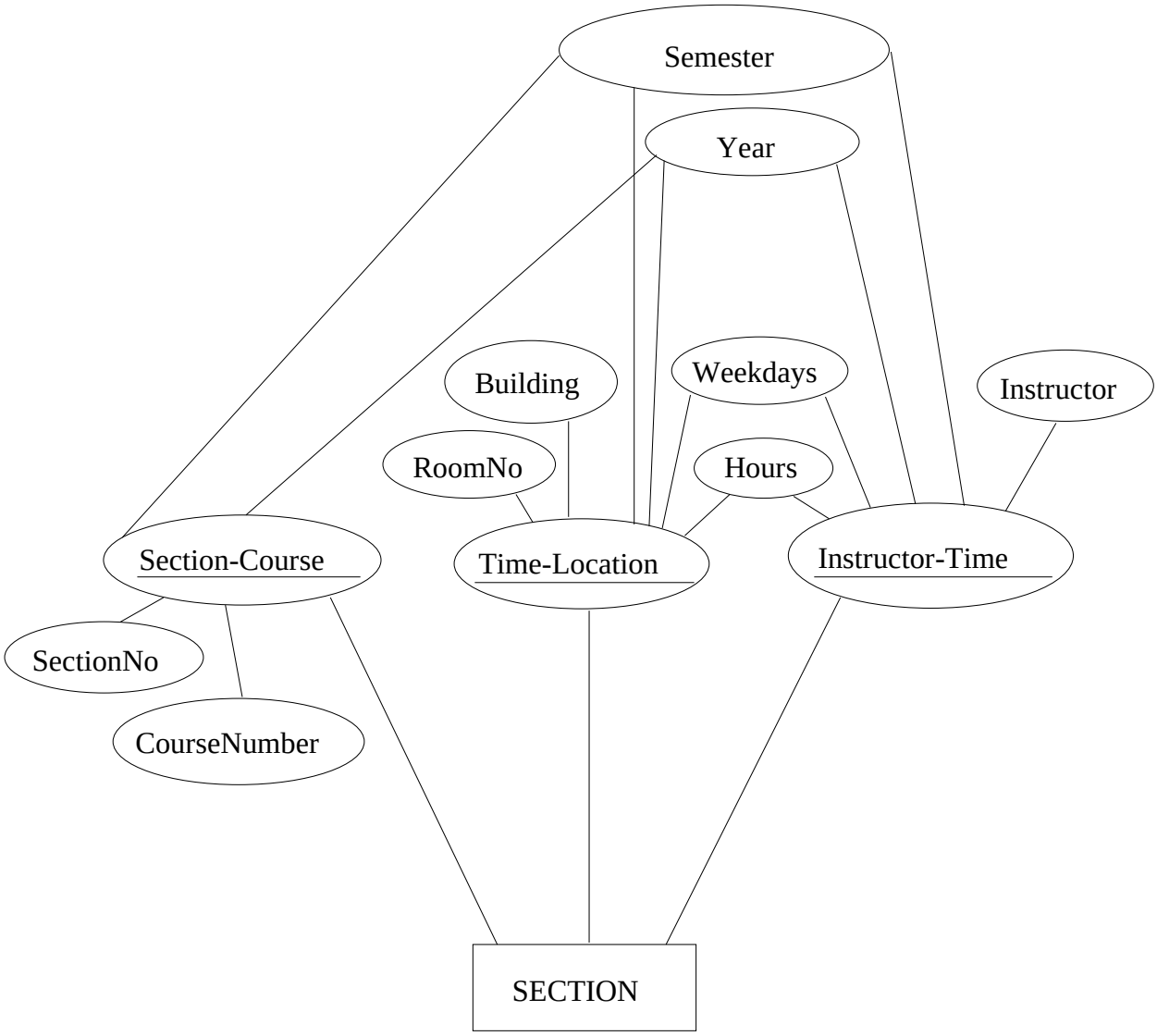
- **d)** List the names of all relationship types, and specify the (min, max) constraint on each participation of an entity type in a relationship type. Justify your choices.

  $BANK - \overset{(1,N)}{---} BRANCHES - \overset{(1,1)}{---} BANK - BRANCH$
  $ACCOUNT - \overset{(1,1)}{---} ACCTS - \overset{(0,N)}{---} BANK - BRANCH$
  $ACCOUNT - \overset{(1,N)}{---} A - C - \overset{(0,N)}{---} CUSTOMER$
  $CUSTOMER - \overset{(0,N)}{---} L - C - \overset{(1,N)}{---} LOAN$
  $BANK - BRANCH - \overset{(0,n)}{---} LOANS - \overset{(1,1)}{---} LOAN$

Exercise 3.26 (10 points)

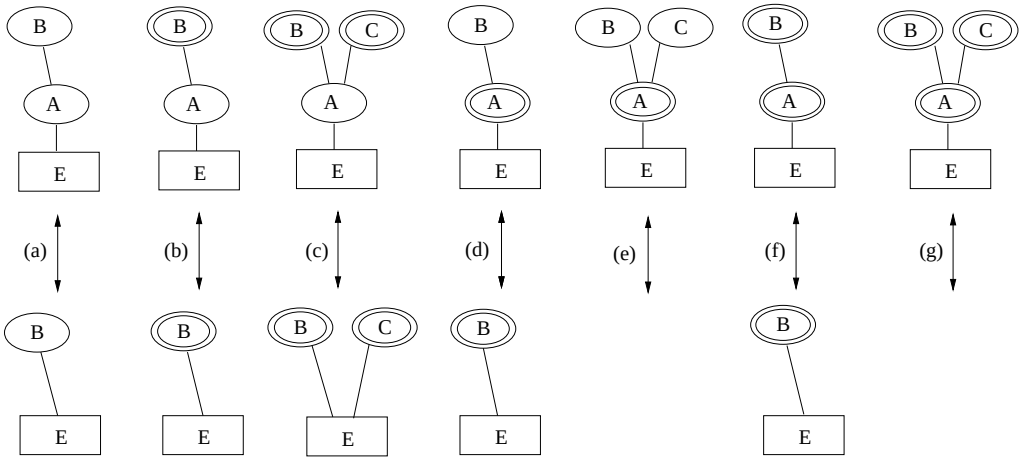
The three possible composite keys are:

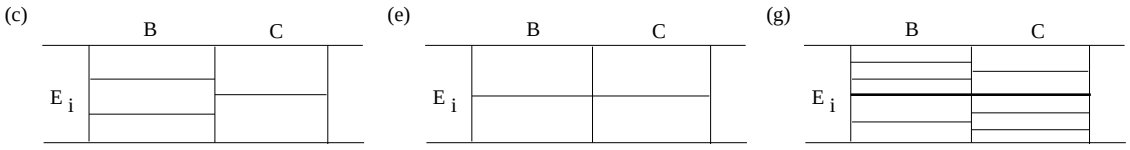
- Section-Course (SectionNumber, CourseNumber, Semester, Year)
- Time-Location (Hours, Weekdays, Semester, Year, RoomNo, Building)
- Instructor-Time (Instructor, Hours, Weekdays, Semester, Year)



Discussion of Homework 1

- **Composite Attribute Notation:**





- **Double Line Notation:**
  - Please do not use double line to indicate the total participation if you use (min, max) for cardinality ratio.
  - Please use double line from a weak entity type to the identifying relationship type either in 1, M, N or (min, max) notations.

- **Cardinality Ratio Mapping between 1, M, N and (min, max)**

  Let a is an integer and $1 \leq a \leq N$ in the figure below.