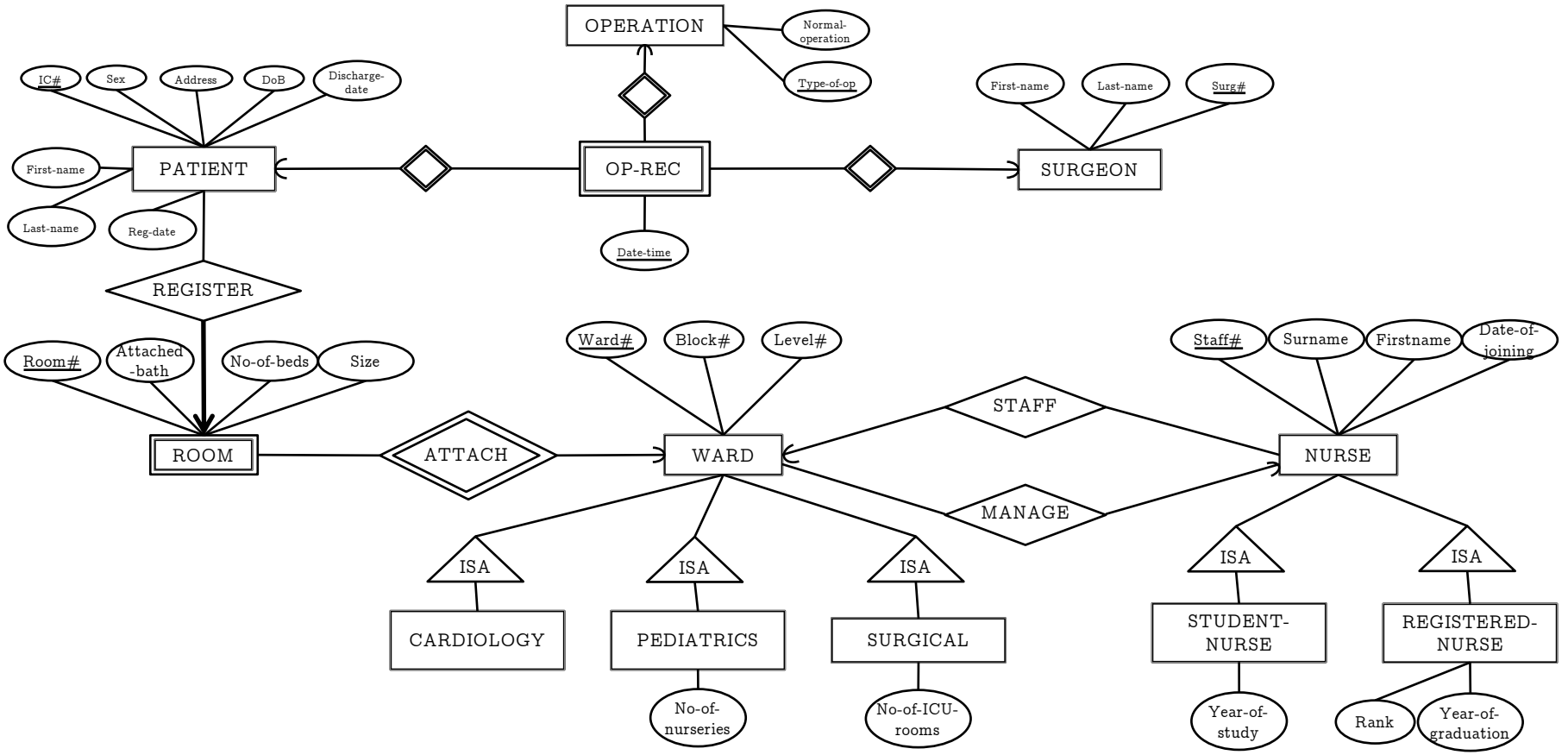
CZ2007 Tutorial 2: ER Diagram + FDs

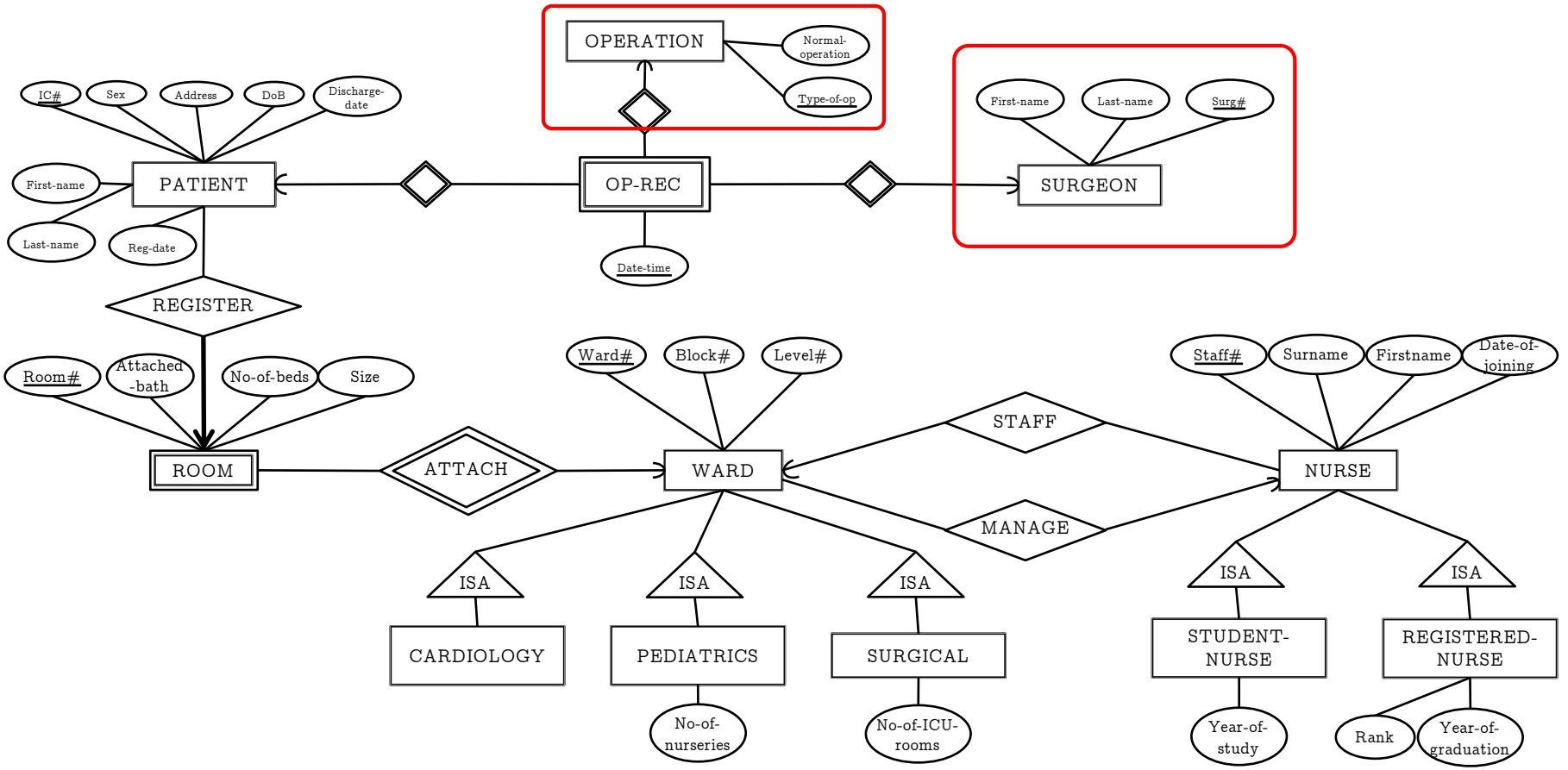
Week 4

Question 1

1. Translate the ER Diagram of Q1 in Tutorial 1 into a set of relations.

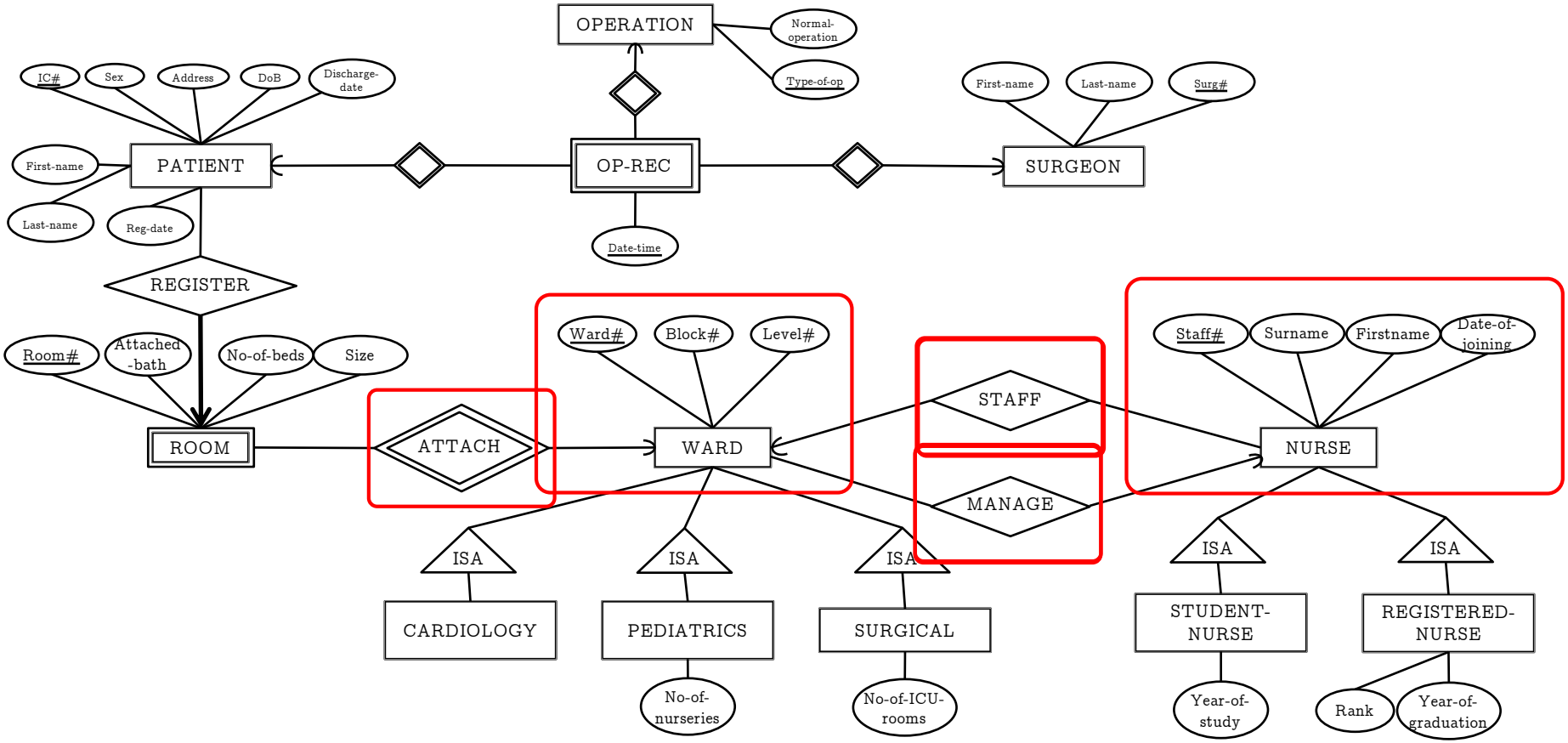


Question 1



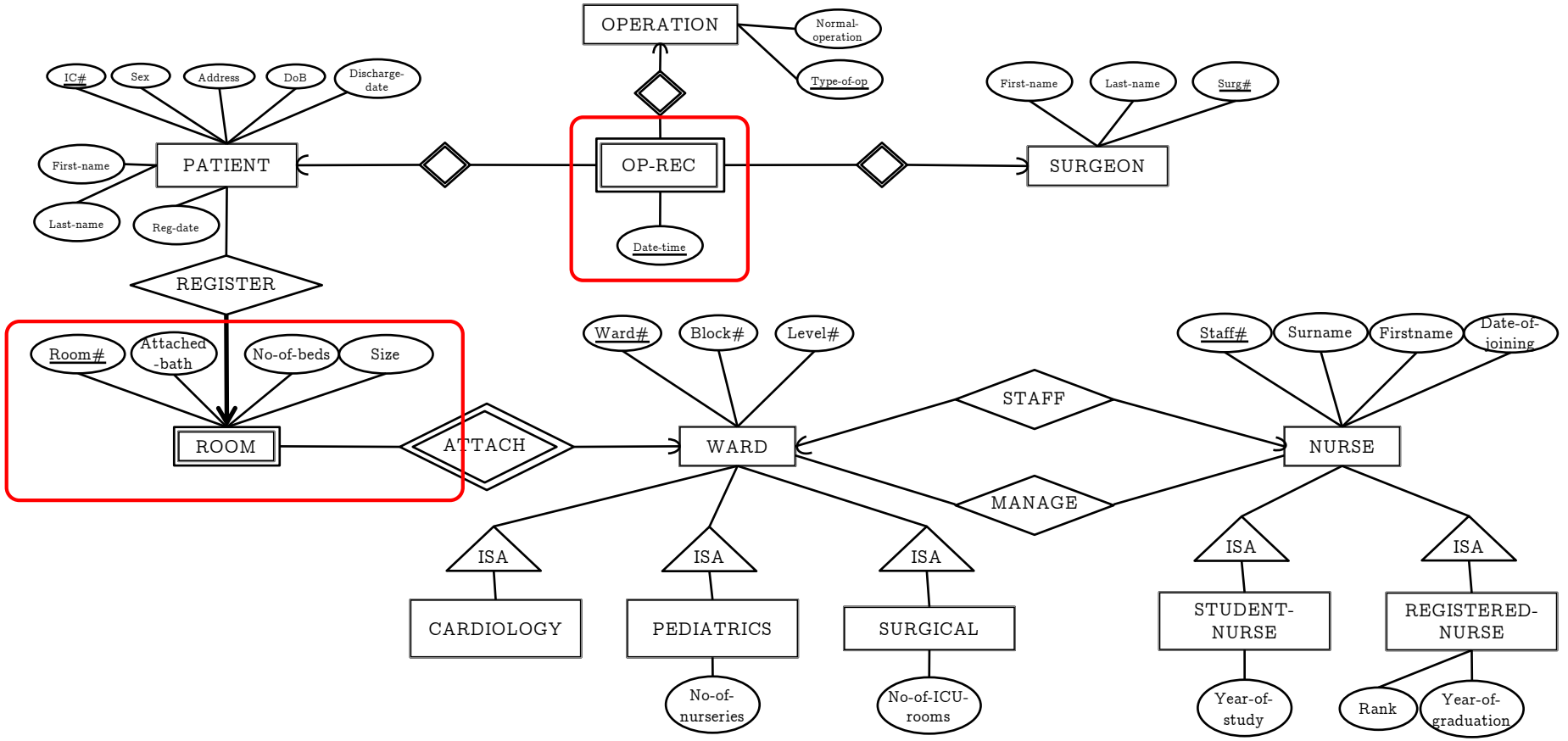
- Surgeon (surg#, first-name, surname)
- Operation (type-of-op, normal-duration)

Question 1



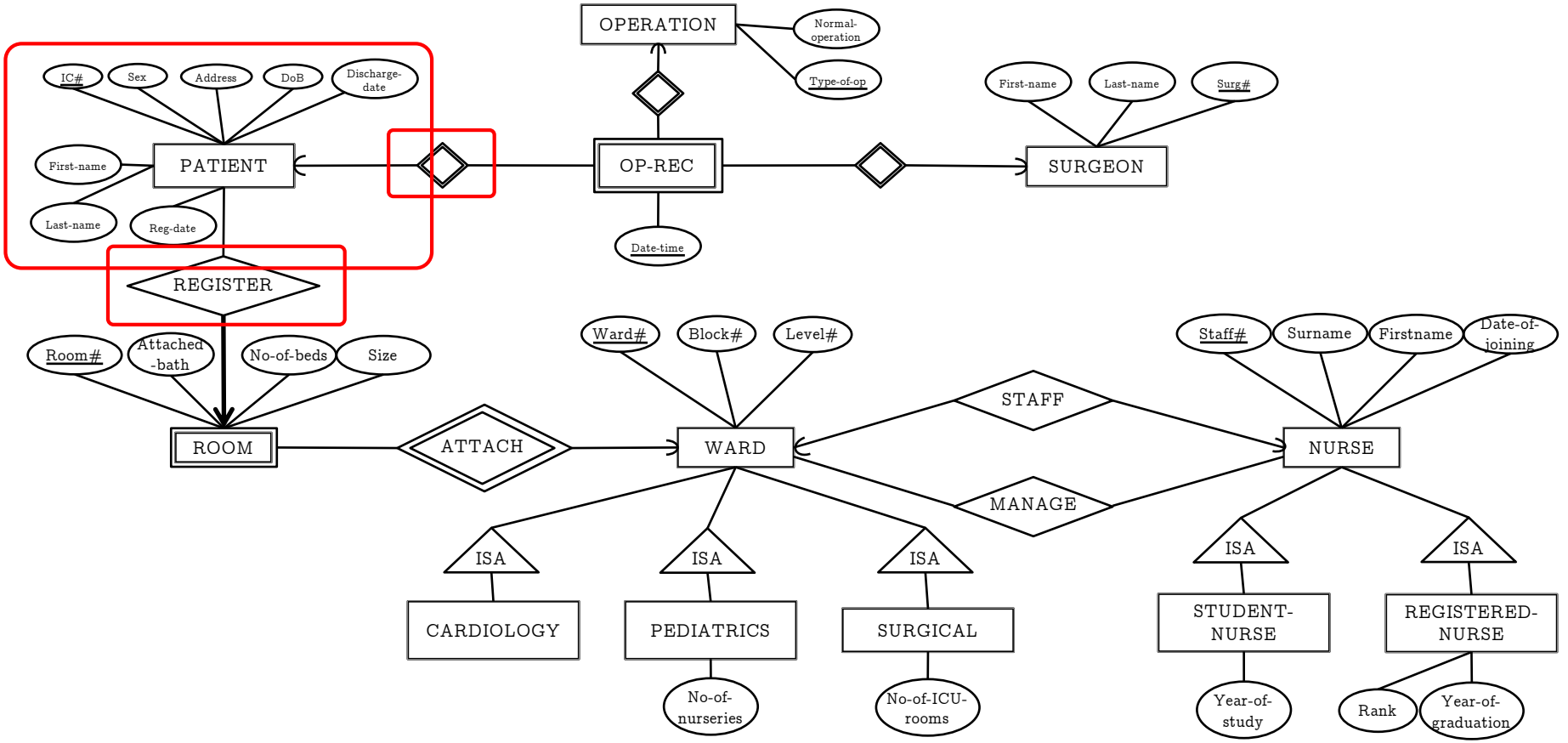
- Ward (<u>ward#</u>, blk#, level#, manager) – m2o
- Nurse (<u>staff#</u>, first-name, surname, date-of-joining, ward#) – m2o

Question 1



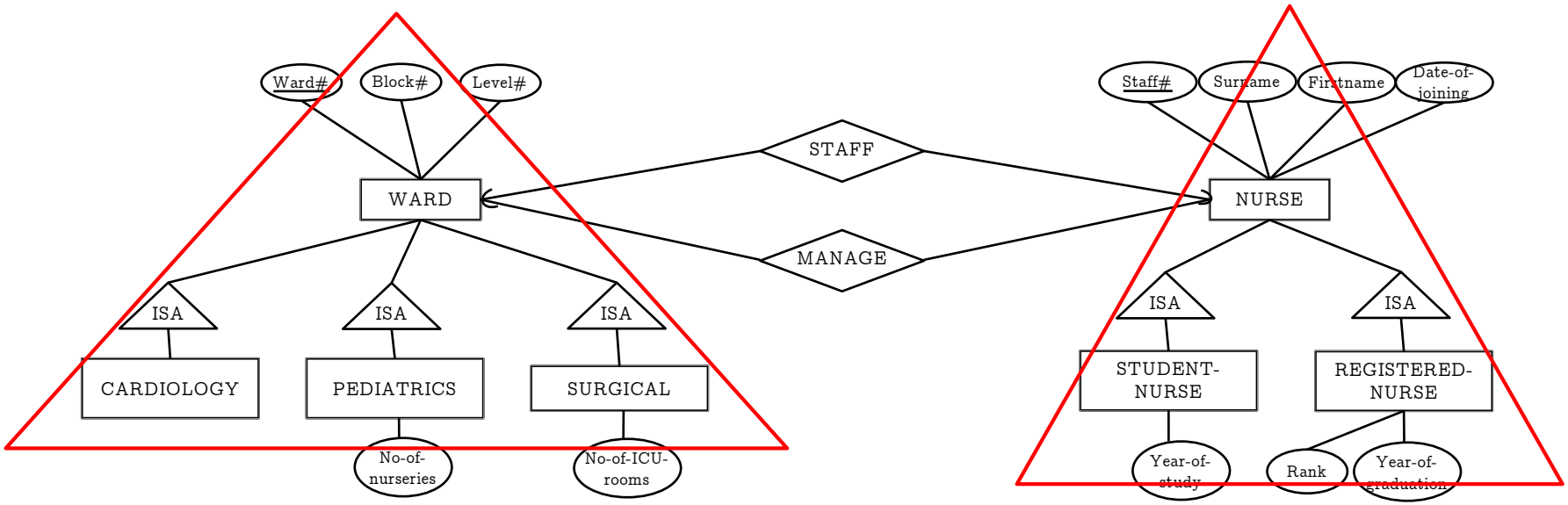
- Operate (<u>IC#, surg-id, type-of-op, date-time</u>) – 3 w.e./m2o
- Room (<u>room#, ward#</u>, attached-bath, no-of-beds) – w.e./m2o

Question 1



- Patient (IC#, first-name, surname, address, date-of-birth, sex, reg-date, discharge-date, room#, ward#) – m2o

Question 1



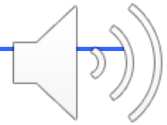
- Student_Nurse(staff#, year-of-study)
- Registered_Nurse(staff#, rank, year-of-graduation)
- Surgical_Ward(ward#, no-of-ICU-rooms)
- Pediatrics_Ward(ward#, no-of-nurseries)
- Cardiology_Ward(ward#, no-of-heart-equipment)

Question 2

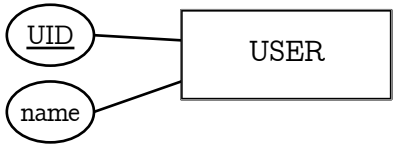
2. Consider the following relational schema:

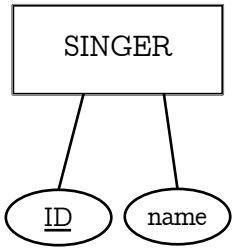
USER(<u>uid</u>, name)
SINGER(<u>id</u>, name)
ALBUM(<u>id</u>, title, singerid)
SONG(<u>id</u>, title, albumid)
SING(<u>singerid, songid</u>)
FOLLOW_USER(<u>followeruid, followeeuid</u>)
RATE_SONG(<u>uid, songid</u>, rating)
RATE_SINGER(<u>uid, singerid</u>, rating)
PLAY_SONG(<u>uid, songid, datetime</u>)

Construct an ER diagram that leads to the above schema.



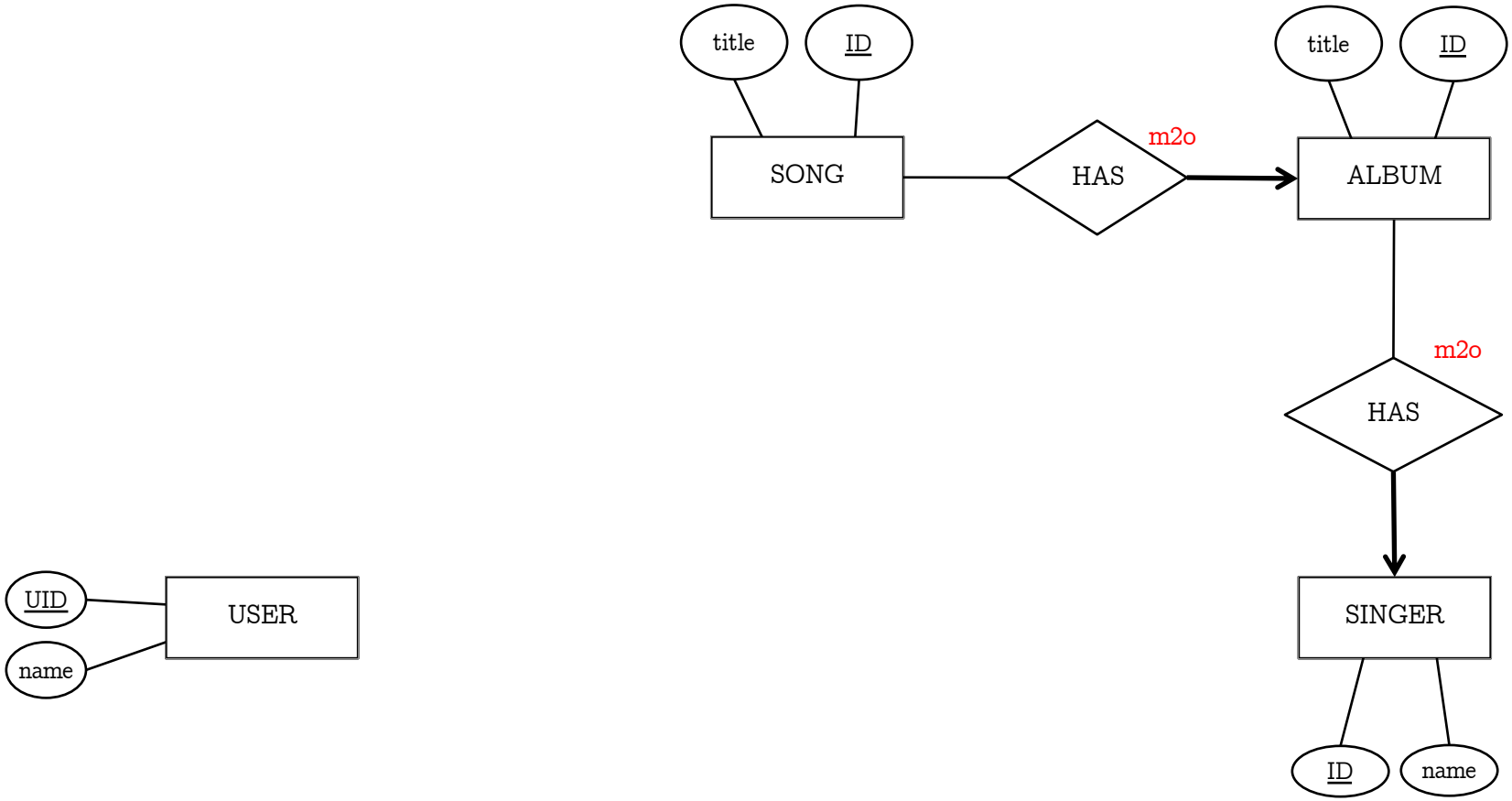
Question 2





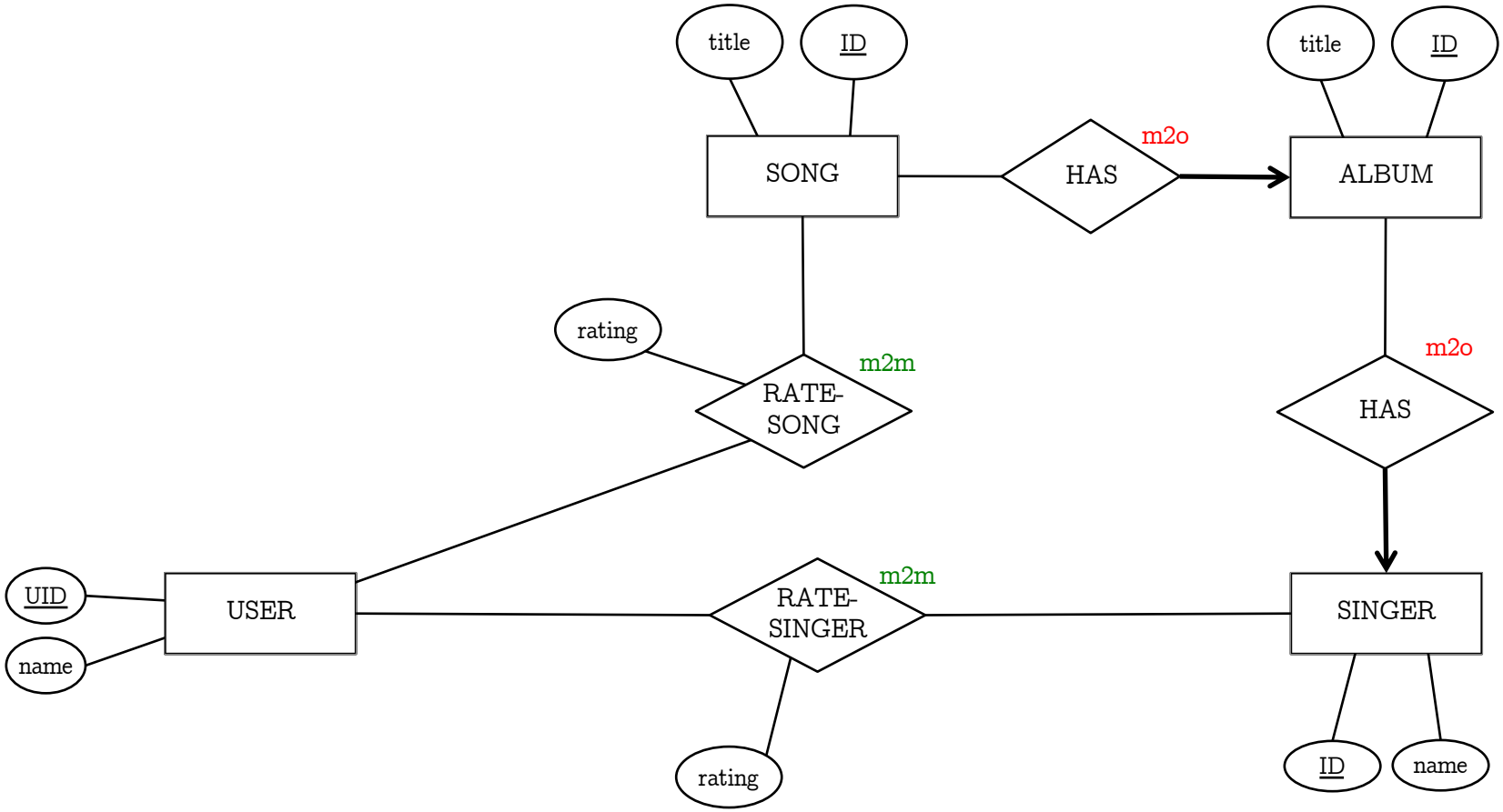
- USER(<u>uid</u>, name)
- SINGER(<u>id</u>, name)

Question 2



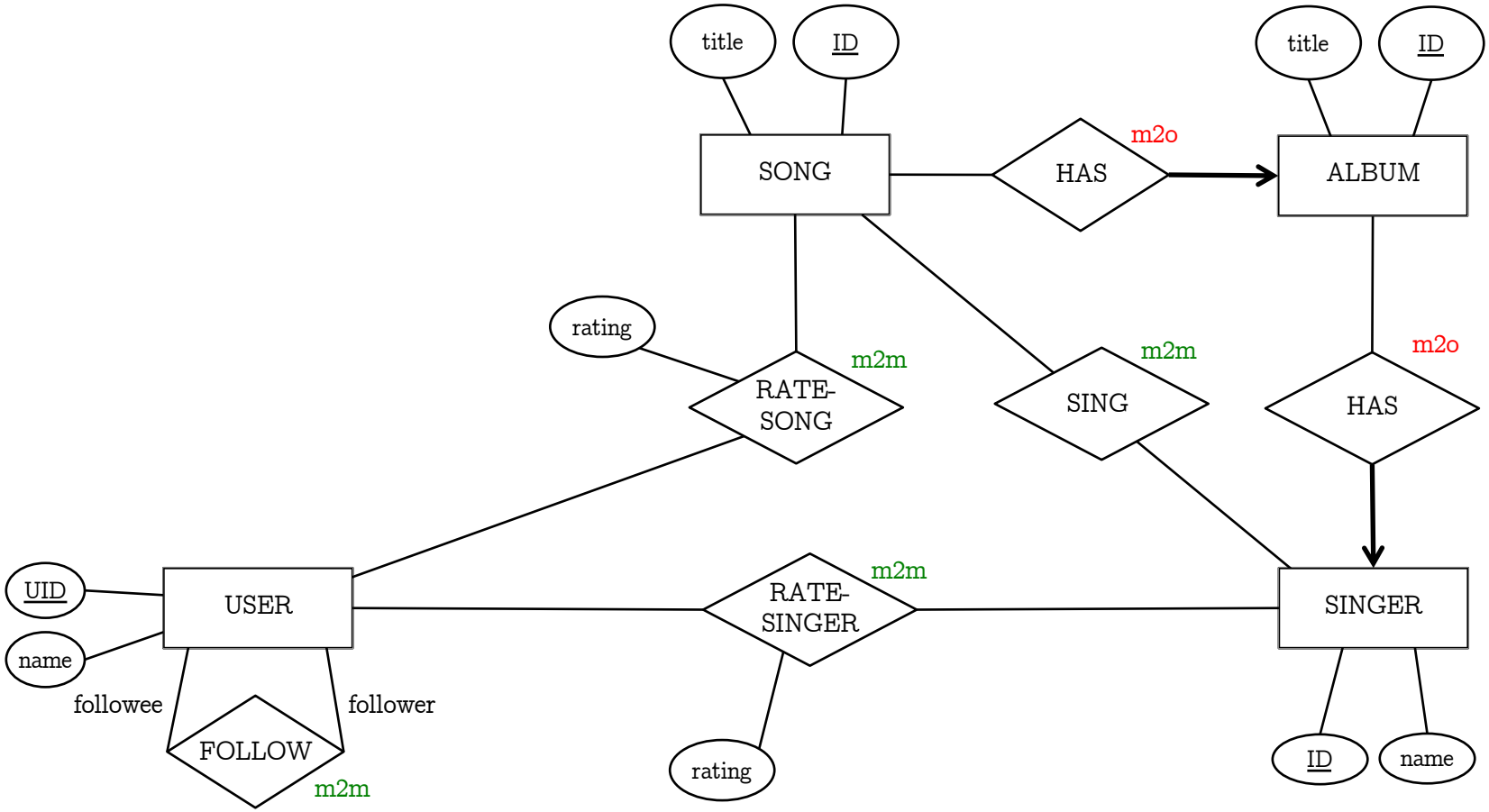
- ALBUM(<u>id</u>, title, singerid)
- SONG(<u>id</u>, title, albumid)

Question 2



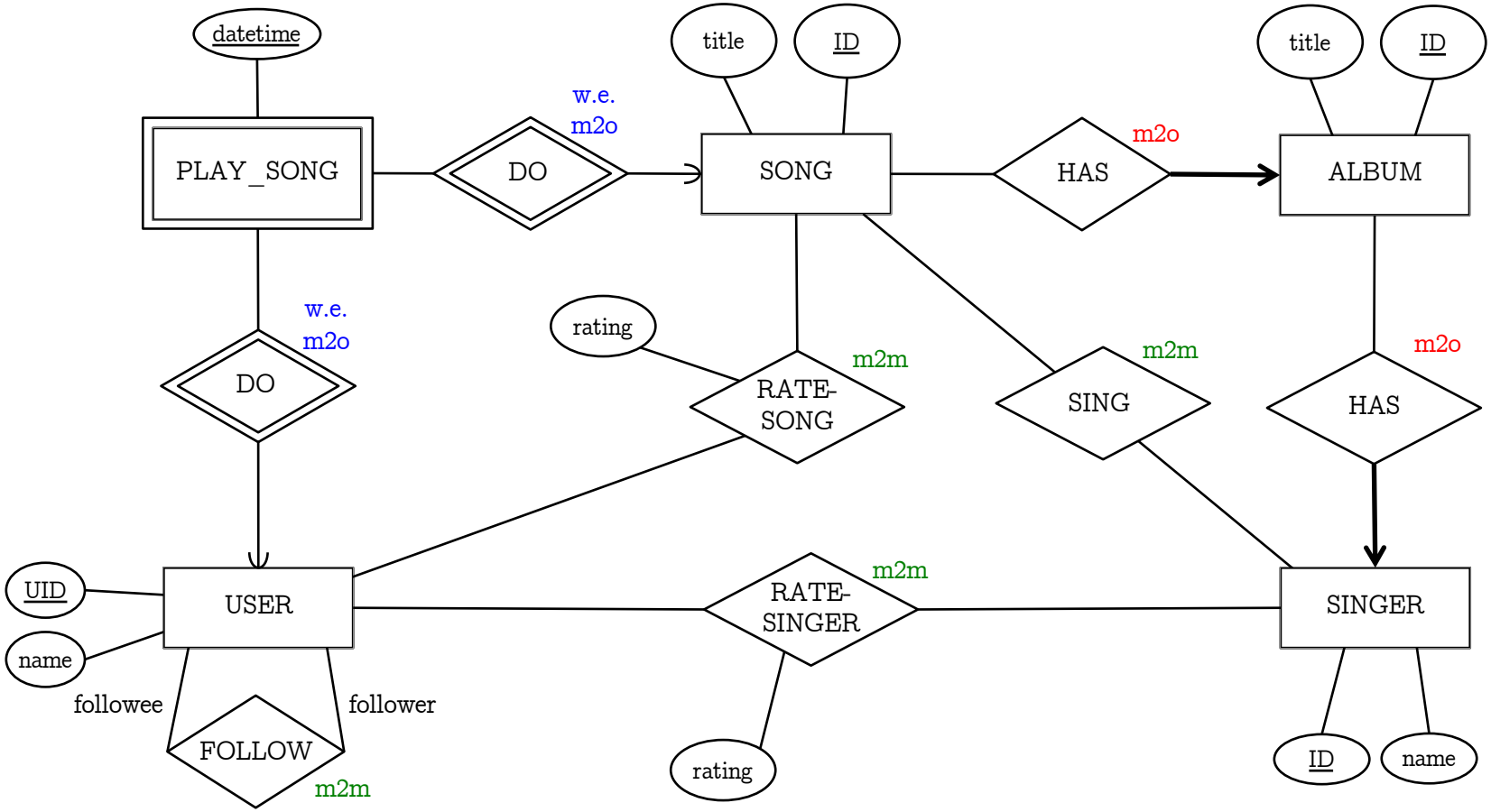
- RATE_SONG(uid, songid, rating)
- RATE_SINGER(uid, singerid, rating)

Question 2

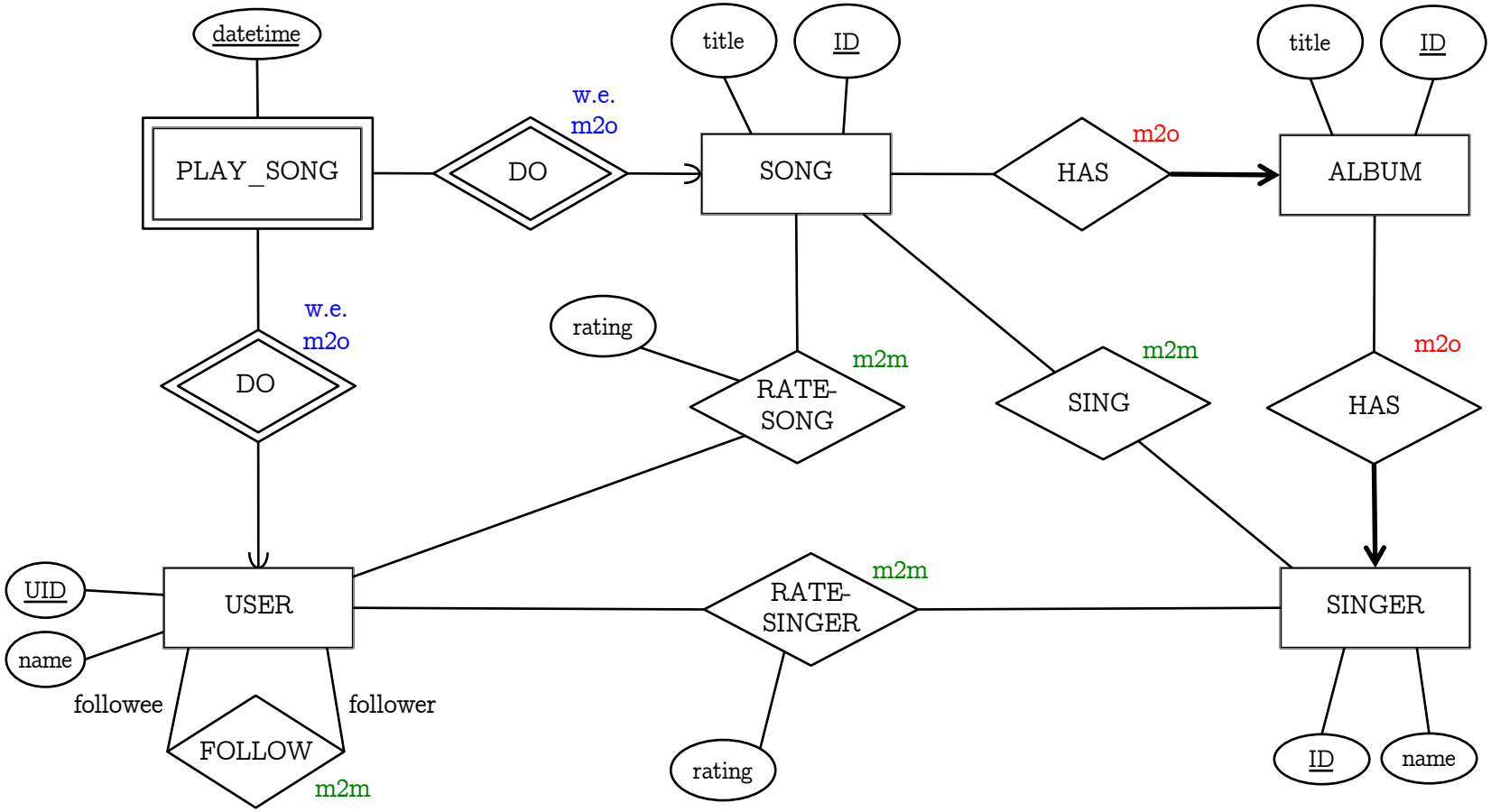


- SING(<u>singerid, songid</u>)
- FOLLOW(<u>followeruid, followeeuid</u>)

Question 2

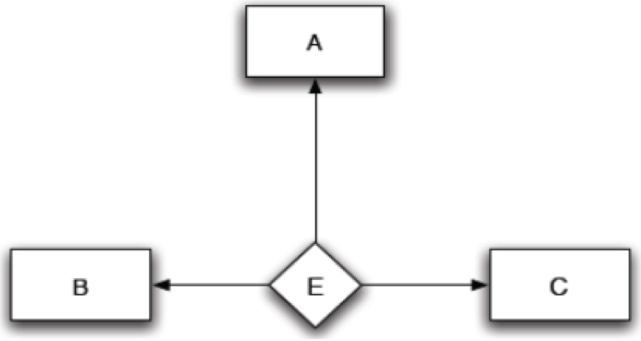


- PLAY_SONG(uid, songid, datetime)

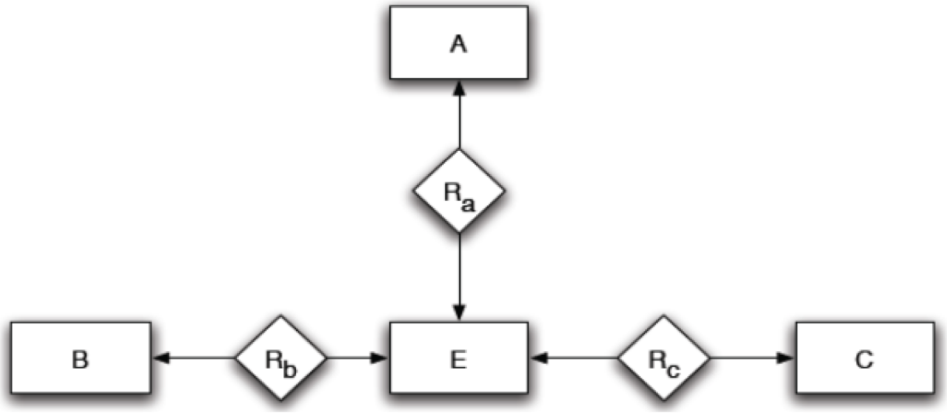

datetime
PLAY_SONG
w.e.
m2o
DO
title
ID
SONG
HAS
m2o
title
ID
ALBUM
w.e.
m2o
DO
rating
RATE-
SONG
m2m
SING
m2m
m2o
HAS
UID
USER
name
followee
follower
FOLLOW
m2m
RATE-
SINGER
m2m
rating
SINGER
ID
name

Question 3

3. The figure shows an attempt to represent a ternary relationship between three entities using 3 binary relationships (and one made-up entity). Show through an example why the 3 binary relationship representation is more general than the one ternary relationship representation.

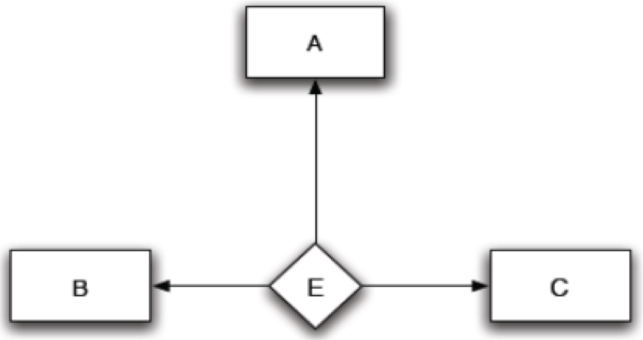


A ternary relationship

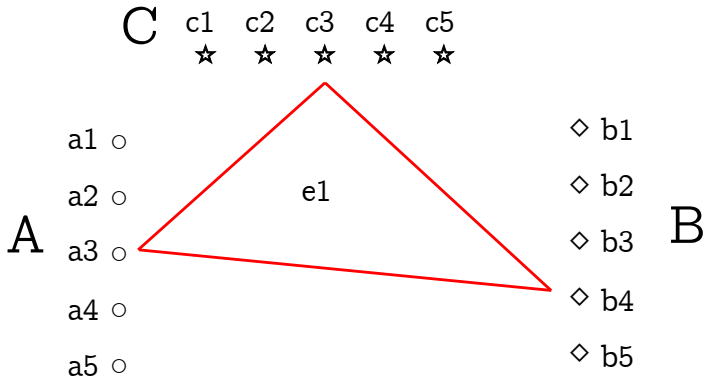


An attempt to represent it using 3 binary relationships

Question 3



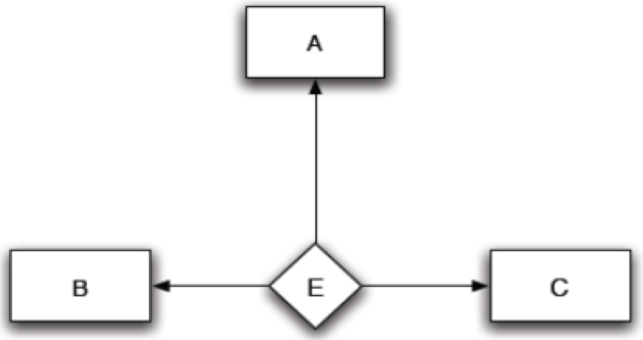
A ternary relationship



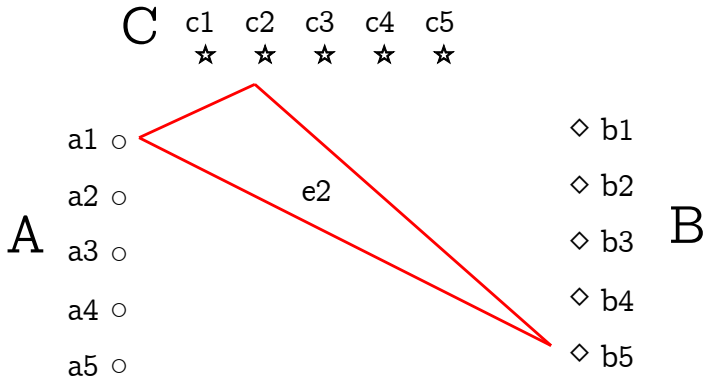
e1 is relationship instance

involving a3, b4, c3

Question 3



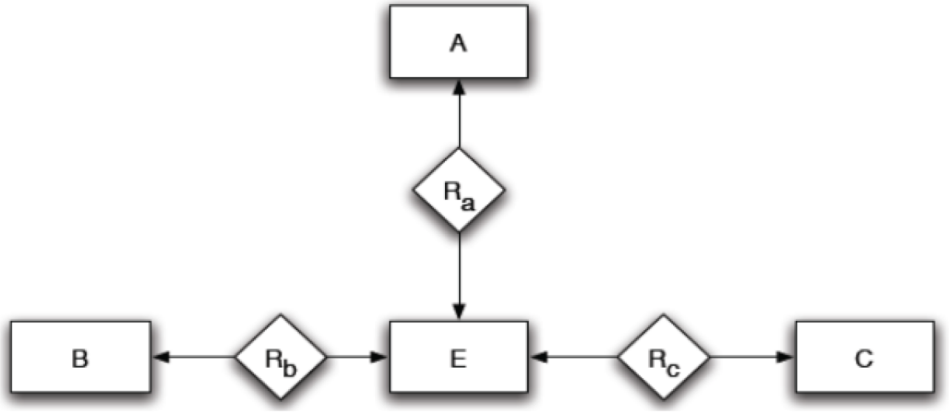
A ternary relationship

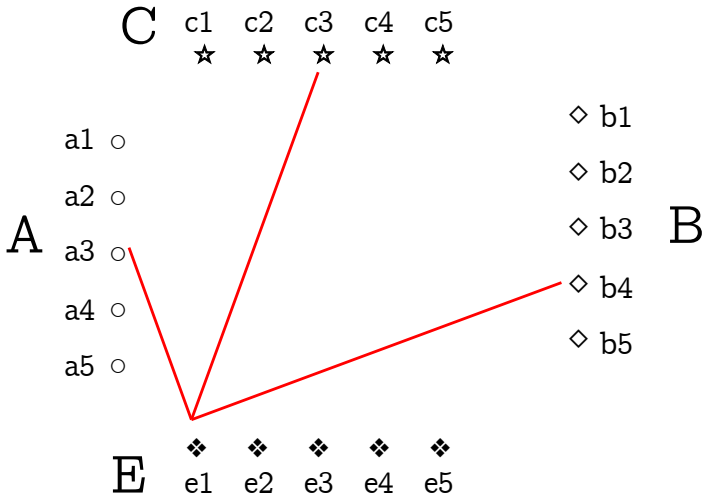


e2 is relationship instance

involving a1, b5, c2

Question 3





e1 related to a3,

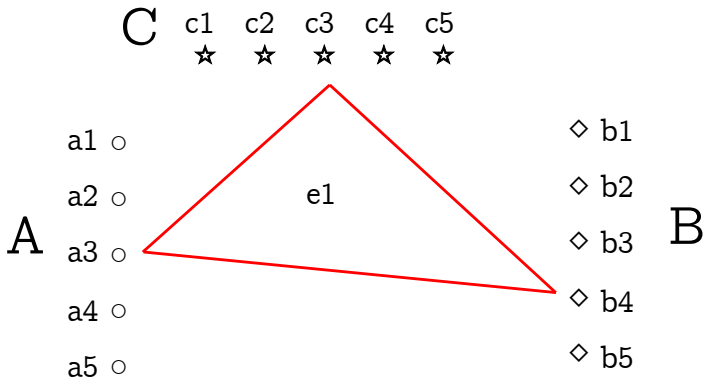
e1 related to b4,

e1 related to c3

Question 3

e1 is relationship instance

involving a3, b4, c3

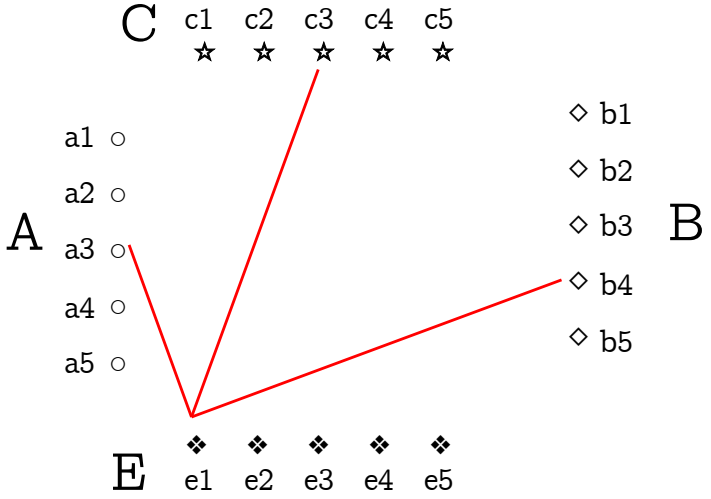


Single ternary relationship

e1 related to a3,

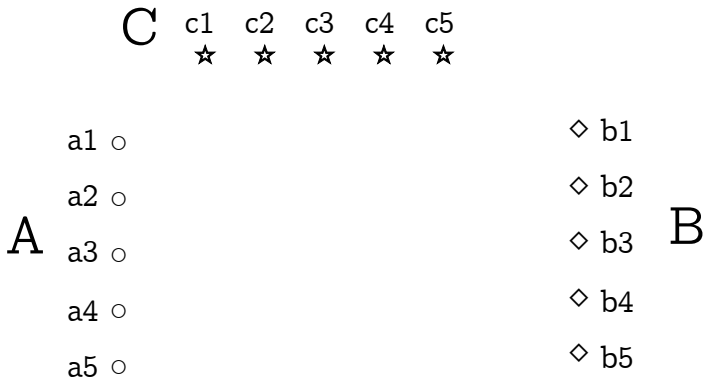
e1 related to b4,

e1 related to c3



3 binary relationship + 1 entity set

Question 3

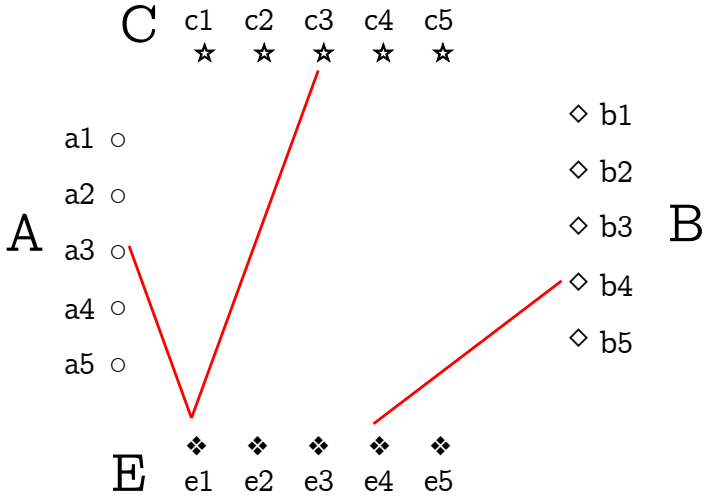


Single ternary relationship

e1 related to a3,

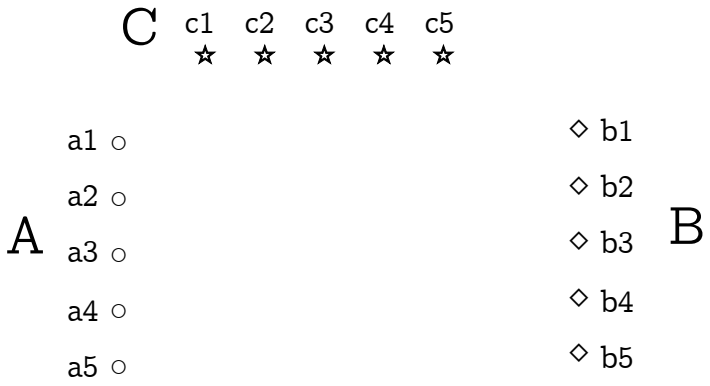
e4 related to b4,

e1 related to c3



3 binary relationship + 1 entity set

Question 3

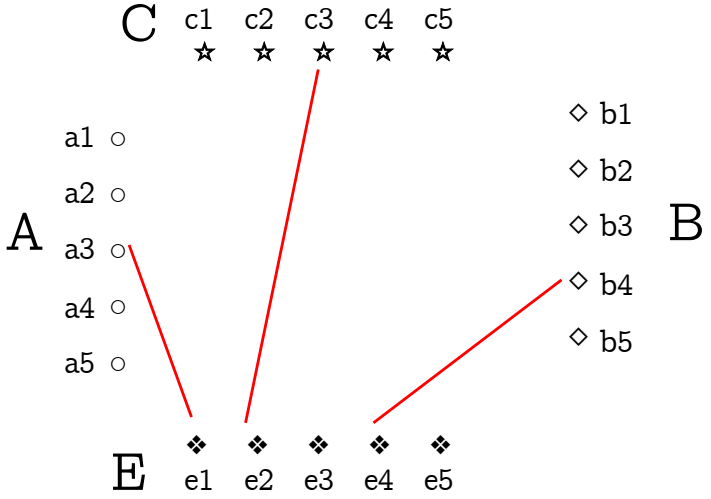


Single ternary relationship

e1 related to a3,

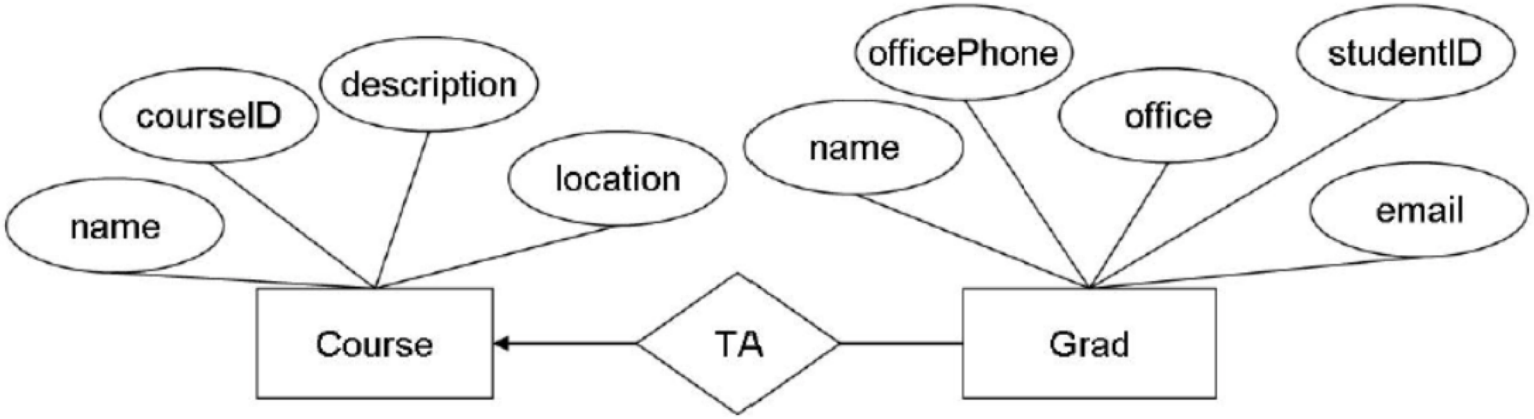
e4 related to b4,

e2 related to c3



3 binary relationship + 1 entity set

4. Consider the following ER diagram thath describes graduate students (Grad) and courses (Course) they serve as Teaching Assistants (TA).



(a) For each of the following statements, write a functional dependency (FD) that best captures the statement.

- The studentID of each graduate student uniquely identifies the student.
- No two offices have the same phone number (officePhone).
- No two courses have the same courseID.
- If two courses have the same course name, their course descriptions are the same.

(b) From the ER diagram and the set of FDs you listed above, can you derive new FDs? If no, explain why not. If yes, derive two non-trivial FDs.

Question 4(a)

(a) For each of the following statements, write a functional dependency (FD) that best captures the statement.

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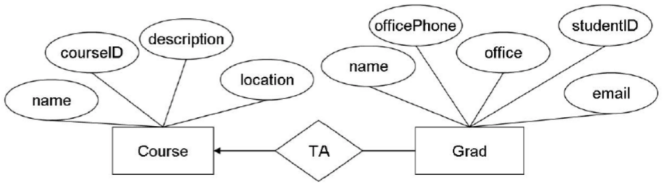
- No two offices have the same phone number (officePhone).
- No two courses have the same courseID.
- If two courses have the same course name, their course descriptions are the same.

- F1: studentID $\rightarrow$ officePhone, office, email, name
- F2: officePhone $\rightarrow$ Office
- F3: courseID $\rightarrow$ name, description, location
- F4: name $\rightarrow$ description

Question 4(b)

(b) From the ER diagram and the set of FDs you listed above, can you derive new FDs? If no, explain why not. If yes, derive two non-trivial FDs.

- F1: studentID $\rightarrow$ officePhone, office, email, name
- F2: officePhone $\rightarrow$ Office
- F3: courseID $\rightarrow$ name, description, location
- F4: name $\rightarrow$ description



- F5: studentID $\rightarrow$ courseID. This is derived from m2o TA relationship.
- F6: studentID $\rightarrow$ name, description, location. This is derived from F3 and F5.


Winners are not people who never fail
but people who never quit.
Best of Luck