

# Assignment 1

Q1:

Logical independence is harder than physical data independence. Logical data is more important for database system. It shows the logical structure. While physical data independence is only about the files and indexes.

Q2.

- a) sid is the primary key for Student(). Every student shall have a unique *sid*.  
fid is the primary key for Faculty(). Every faculty shall have a unique *fid*.  
cid is the primary key for Courses(). Every course shall have a unique *cid*.  
rno is the primary key for Rooms(). Every room shall have a unique *rno*.  
sid and cid from a composite primary key for Enrolled().  
fid and cid from a composite primary key for Teaches().  
rno and time from a composite primary key for MeetsIn().

The other keys shall follow these conditions:

*age* from Students(): *age* > 0

*gpa* from Students(): *gpa* >= 0 and *gpa* <= 4.0(or 12.0 for McMaster)

*sal* from Faculty(): *sal* > 0

*credits* from Courses(): *credits* >= 0

*capacity* from Rooms(): *capacity* > 0

*grade* from Enrolled(): *grade* in ['A+', 'A', 'A-', 'B+', ..., 'F', 'W']

*time* from MeetsIn(): *time* should have the form like: HH:MM. Where HH is the meeting hour and MM is minute.

- b) The key *cid* is a primary key in Courses(). And it is a foreign key in Enrolled().  
The key *sid* is a primary key in Students(). And it is a foreign key in Enrolled().  
The key *fid* is a primary key in Faculty(). And it is a foreign key in Teaches().  
The key *cid* is a primary key in Courses(). And it is a foreign key in MeetsIn().  
The referential integrity is necessary because it gives the ability to connect two entity types. And it keeps the association between entities always valid.
- c) Domain constraint: *credits* from Courses() equals the last digits in *cid* (i.e. cs 3DB3 is the course ID, the credit is 3.) It is a domain constraint, because the *credits* only depends on *cid* from the same tuple, but independently with other tuples.  
Tuple constraint: *gpa* >= 0 and *gpa* <= 4. It is a tuple constraint since it only involves a single attribute which is *gpa*.