CS 353 Spring 2022
Homework 1
Due: 16 February, Wednesday till midnight
You will use the Moodle course page for submission of this assignment

Q.1 [24 pts, 6 pts each] Given the following relational schema:

course(c-id, cname, department)
instructor(i-id, iname)
teaches(i-id, c-id, semester)

Note that a course may have multiple sections taught by different instructors in a particular semester.
Explain in words what results are returned by the following **Relational Algebra** expressions:

(a) $\prod_{iname}(\sigma_{c\text{-}id=\text{“CS102”}}(course) \bowtie \sigma_{semester=\text{“Spring22”}}(teaches) \bowtie instructor)$

(b) $\prod_{iname}((\prod_{i\text{-}id}(instructor) - \prod_{i\text{-}id}(\sigma_{department=\text{“CS”}}(course) \bowtie \sigma_{semester=\text{“Spring22”}}(teaches))) \bowtie instructor)$

(c) $c\text{-}id\ \mathcal{G}_{count(*)}(\sigma_{department=\text{“CS”}}(course) \bowtie \sigma_{semester=\text{“Spring22”}}(teaches))$

(d) $Temp1 \leftarrow c\text{-}id\ \mathcal{G}_{count(*)\ as\ cnt}(\sigma_{department=\text{“CS”}}(course) \bowtie \sigma_{semester=\text{“Spring22”}}(teaches))$

$Temp2 \leftarrow \mathcal{G}_{max(cnt)\ as\ cnt}(Temp1)$

$\prod_{cname}(Temp1 \bowtie Temp2 \bowtie course)$

Q.2 [76 pts. First 2 parts 5 pts each, the rest 6 pts each]
Given the following relational schema:

Movie (Title, Year, Rating)
Actor (SSN, Name, Byear, Phone)
Acts (SSN, Title, Role)
Theater (TName, City)
Schedule (TName, Title, Date, Time, TicketPrice)

Give Relational Algebra expressions for the queries given below:

(a) Find the movies (Titles) shown in the theaters in Ankara during the last year (i.e., in 2021).
(b) Find the theaters (Tnames) in Ankara showing the movies of the last year (i.e., 2021).
(c) Find the theaters in Ankara showing only the movies of the last year.
(d) Find the ticket prices of the movies with a rating higher than 4.0 which are shown in the theaters in Ankara within this month (in February).
(e) Find the name and birth year of the actors who have appeared in the movies of the last year which has a rating higher than 2.5.
(f) Find the names of the actors who are older than 50 and have appeared in the movies which have a rating higher than 3.0 and were shown in the theaters in Ankara during the last year.
(g) Find the theaters in Ankara showing all the movies of Anthony Hopkins.
(h) Find the theaters in Ankara not showing the movies of Jodie Foster.
(i) Apply a 10% increase in the ticket price of the theaters in Ankara.
(j) Find the movie of the last year with the highest rating. Do not use any aggregate function.
(k) Find the movie of the last year with the highest rating, using aggregate functions.
(l) For each year find the movie with the highest rating.
(m) Find the year in which the highest number of movies were produced.