

CSE255 Introduction to Databases – Midterm Exam

Name: _____

Problem	Points	Score
1	15	
2	10	
3	20	
4	15	
5	15	
Total	75	

Please show all work to receive ANY credit!!!!

Roughly equate 15 points to fifteen (15) minutes of time/effort.

1. (15 points) **ER Design using Specialization** Please consider the TV Show/Movie relational schema as the requirements of a database to store that information. Using that schema as a basis, please identify and model the following:
 - (a) (5 points) One example of disjoint specialization in the schema.
 - (b) (5 points) One example of overlapping specialization in the schema.
 - (c) (5 points) One example of a union using categories in the schema.

Make sure that you model all of the involved entities (parents and children with attributes) and relationships (if needed for each case) and indicate total participation (if relevant). Note that of the three types of specialization above, disjoint and overlapping examples are rather straightforward in the relational schema, while identifying and modeling an example of union may not be as obvious. Note also that you may need to provide additional attributes (not in the schema) that assist you in modeling your solutions to 1a, 1b, and/or 1c. Make sure you write down any assumptions that you make for each solution.

Problem 1 solution on this page.

2. **(10 points) Relational Algebra**

This question requires you to write relational algebra queries against the TV Show/Movie relational schema. Note that you are allowed to use variables (relations) to hold intermediate results if your answer is in multiple steps.

- (a) **(5 points)** List the full name of an actor that has been a Star in a Movie and a Guest-Star in a TVShow.

- (b) **(5 points)** List the full name and the movie name for all directors who have won an Oscar for a movie that grossed less money than it cost to make.

3. (20 points) SQL Queries

Specify the following SQL Queries on the TV Show/Movie schema.

(a) **(5 points)** List the full name of all actors who have never been directors.

(b) **(5 points)** List the TV show name and StartYear for all TV shows that have been on TV for at least 5 years and that have the episode name "The Pilot".

(c) **(5 points)** List the full name, NumYears, and State of Actors that have won at least one Oscar and at least one Emmy.

(d) **(5 points)** List the role name (first and last) of all Movies and TV Shows that “Steve Martin” has had a role in.

Problems 4 and 5 are based on a revised version of the TV Show/Movie schema as given below, Notice that: PERSON is unchanged; TVRoles and MovieRoles have been combined into ROLES using boolean flags (TVFlag, MFlag) to distinguish unique attributes; TVShows and Episodes have been combined into TVSHOWS; TVDirectors and MovieDirectors have been combined into DIRECTORS (with TVFlag and MFlag); and, MOVIES is unchanged. For ROLES and DIRECTORS, if the show is a movie (MFlag = true), then EpisodeID = E1; if the show is a TV Show (TVFlag = true), the the EpisodeID has a value from E1 up to the number of episodes for that show. If TVFLag is true, then EmmyFlag has a non-null value. If MFlag is true, then OscarFlag has a non-null value.

PERSON (LName, FName, NumYears, State, PersonID);
ROLES (RLName, R FName, ShowID, EpisodeID, RoleID, PersonID,
RoleType, TVFlag, EmmyFlag, MFlag, OscarFlag);
TVSHOWS(ShowName, StartYear, NumSeasons, ShowID, NumEmmy,
EpisodeID, EName, EDesr);
DIRECTORS(PersonID, ShowID, EpisodeID, TVFLag, EmmyFlag, MFlag, OscarFlag);
MOVIES(MovieName, Year, Cost, Gross, ShowID, NumOscar);

4. (15 points) Update Anomalies

For each relation, discuss the anomalies that exist in the revised TV Show/Movie Schema. If anomalies do not exist in a relation, explain why (1 or 2 sentences). If anomalies do exist in a relation, identify which type(s) exist, namely, insertion, deletion, or modification. For each type that does exist, describe an example that causes the anomaly. Focus on anomalies within a single relation rather than across multiple relations.

Continue Problem 4 solution on this page.

5. (15 points) **Functional Dependencies**

- (a) (10 points) Define functional dependencies (FDs) for ONLY the three tables **ROLES**, **TVSHOWS**, and **DIRECTORS** in the revised TV Show/Movie schema. List your results on a relation-by-relation basis. Be very specific - do not simply specify that a single attribute determines all others. **Make sure that you use arrow notation for FDs, i.e., $X \ Y \rightarrow Z$, $SSN \rightarrow EmpName \ EmpAddr$.**

- (b) **(5 points)** Multi-valued dependencies occur when one attribute can determine multiple values of another attribute. For example, in the relation `EMPLOYEE(EmpName, ProjName, DependentName)` there are multi-valued dependencies $\text{EmpName} \twoheadrightarrow \text{ProjName}$ (an Employee works on multiple projects) and $\text{EmpName} \twoheadrightarrow \text{DependentName}$ (an Employee has multiple dependents). Identify all multi-valued dependencies in **ONLY** the two tables **DIRECTORS** and **TVSHOWS** for the revised TV Show/Movie schema.