
Computer Science 3743

Database Systems

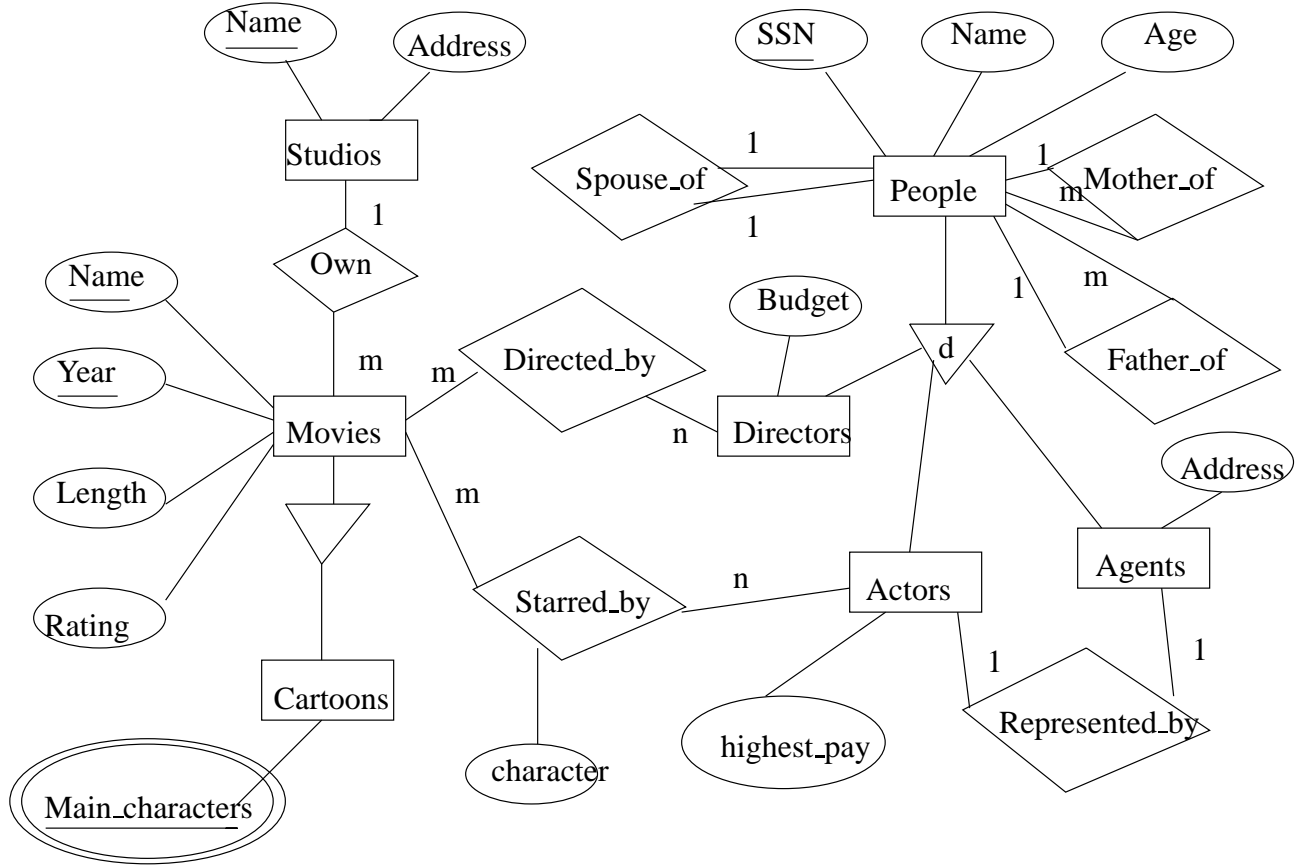
Midterm Exam II

Instructor: Prof. Weining Zhang
Total points: 100

Semester: Spring, 2000
Time: 75 minutes

1. **[10]** List all reasons that views are useful. No discussion is needed.
2. **[25]** Suppose a university library contains books and magazines. Each book is described by a unique ISBN number, a title, its author(s) (by name only), its publisher (by name only), year of publication. Each (issue of) magazine is described by a unique name, date of publication, its publisher (by name only), name of the editor-in-chief. Library items (books and magazines) can be checked out by patrons (users) who are described by a unique SSN, a name and an address. Suppose each faculty member can check out up to 100 books and 20 magazines. Each student can check out up to 20 books and 5 magazines. All other people can each check out up to 15 items (including books and magazines). Each faculty member is additionally described by a rank and a telephone number. Each student is additionally described by a status (freshman, sophomore, ...). Each student and faculty member belongs to a department that is described by a unique name, a location and a telephone number. Design an EER diagram for the above library database.
3. **[15]** Answer yes or no for each of the following statements about functional dependencies in a relation schema $R(A, B, C, D)$. No justification to your answer is needed.
 - (a) If all tuples have the same value under A , then $B \rightarrow A$ is true.
 - (b) If $C \rightarrow D$ and all values under D are different, then $D \rightarrow C$.
 - (c) If $A \rightarrow B$ and $B \rightarrow A$, then the two columns under A and B are identical.
 - (d) If $A \rightarrow B$ but B does not determine C , then A does not determine C .
 - (e) If $A \rightarrow B$ and $C \rightarrow D$, then $AC \rightarrow BD$.
4. Consider a relation schema $R(B, O, I, S, Q, D)$ and the set of functional dependencies on R : $F = \{S \rightarrow D, I \rightarrow B, IS \rightarrow Q, IS \rightarrow O, B \rightarrow O\}$.
 - (a) **[7]** Is R in 3NF? Why?
 - (b) **[7]** Find all candidate keys of R .
 - (c) **[8]** Find the minimal cover F_{min} of F .
 - (d) **[8]** Find a lossless-join and dependency-preserving 3NF decomposition of R .

5. [20] Transform the following EER diagram to relation schemas. Use method 1 to transform the IS_A hierarchy. You need to underline a key for each relation obtained. You also need to indicate foreign keys of each relation as well as the attributes they reference. You may need to properly rename some attributes during your transformation to avoid ambiguity.



Request

Please return the exam sheet with your answers.