CSC 370 - Database Systems

Practice Midterm:
The Relational Data Model

45 MINUTES

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Notes

This examination consists of ten equally-weighted multiple choice questions. You should record your solutions in the provided bubble sheet. Each question has a single best solution; if you record more than one solution for the same question, you will receive a score of zero on that question. If you answer x questions correctly, then your grade on the exam will be x/10, i.e., you must answer at least five questions correctly to pass. This exam is closed-book: you are welcome to bring with you empty pages and a single-sided A4/US letter note sheet, but you cannot bring other notes nor electronic devices to your desk. Please confirm immediately after the exam starts that you have all five pages and ten questions. You may take this booklet with you when you leave, but you must turn in your note sheet.

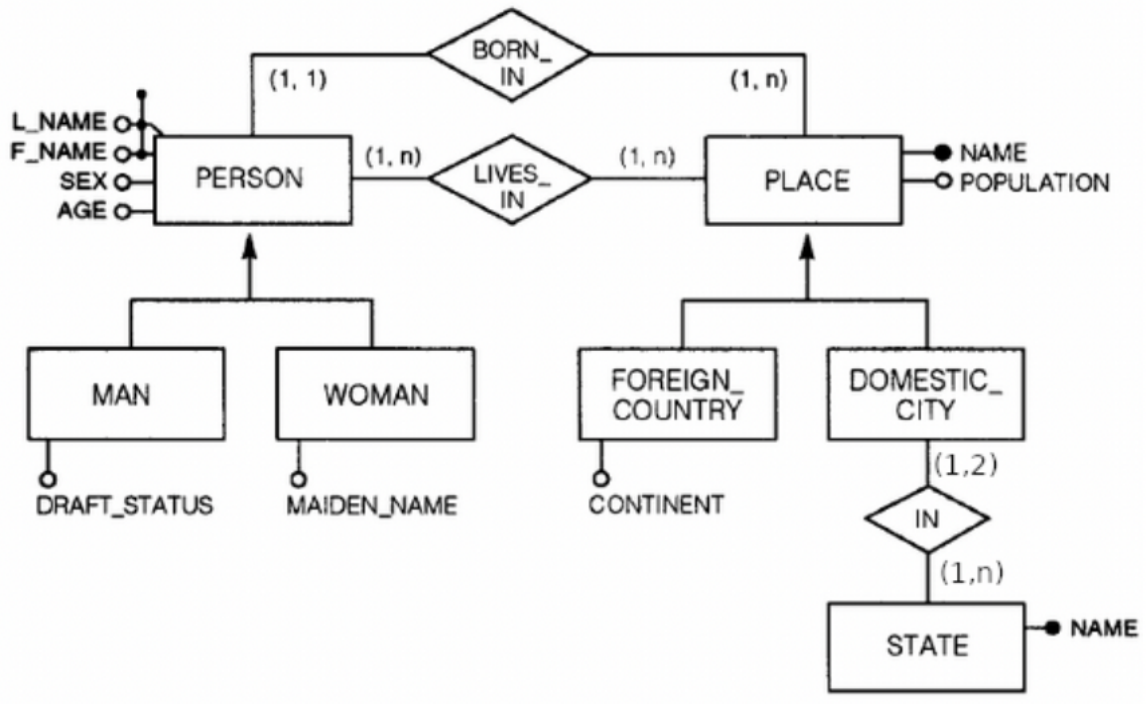

Figure 1: Figure 3.17(d) (Batini et al.), modified.

1. (1 point) Which of the following statements is not accurate in the relational data model?

    A. Tuples are like rows of a two-dimensional table

    B. Attributes are like columns of a two-dimensional table

    C. A relation schema consists of a set of attributes and their data types

    D. A relation instance can be an empty set

2. (1 point) Which of the functional dependencies below is appropriate for a relation, Movies(title, year, genre, leadStar, studioName, imdbRating)

    A. leadStar year → genre

    B. imdbRating leadStar → title

    C. studioName title → imdbRating genre leadStar

3. (1 point) You have a relation R(A, B, C, D, E) and the functional dependencies given below. Which of the following options is a key for R?
   AB → CD
   C → B
   B → A

    A. {A, B}

    B. {C}

    C. {A}

    D. None of the above

4. (1 point) You have a relation R(A, B, C, D, E) and the functional dependencies given below. Which of the following options is a BCNF decomposition that would arise from the recursive algorithm presented in class and in the Garcia-Molina et al. text?
   A → BC
   BC → D
   C → B

    A. S(B, C, D), T(A, C), U(A, E)

    B. S(B, C, D), T(A, B, C), U(C, E)

    C. S(A, B, C, D), T(A, E), U(B, C)

    D. Both (a) and (b)

5. (1 point) You have a relation R(A,B,C,D,E) and the functional dependencies given below. Which of the following options is a 3NF decomposition that would arise from the recursive algorithm presented in class and in the Garcia-Molina et al. text?
   $A \rightarrow BC$
   $BC \rightarrow D$
   $C \rightarrow B$

   A. S(A, B, C), T(B, C, D)

   B. S(A, B, C), T(B, C, D), U(A, E)

   C. S(A, B, C), T(B, C, D), U(B, C)

   D. S(A, B, C, D), T(B, C), U(A, C, E)

   E. Both (c) and (d)

6. (1 point) Which of the following statements best describe the relational algebra expression in Figure 1 below?

$$\pi_B(R) \setminus \pi_D(S) = \emptyset$$

   A. Every tuple of R should exist in S

   B. Referential Integrity: every value of the D attribute in S must appear in the B attribute of R

   C. Key Constraint: The attribute pair {R.B, S.D} is unique in this database

   D. None of the above

7. (1 point) You have a relation R(A, B, C, D, E) and the functional dependencies given below. Which of the following statements best describes the attribute set, {A, B}?
   $A \rightarrow D$
   $BC \rightarrow D$
   $D \rightarrow ADE$
   $C \rightarrow AB$

   A. {A, B} is a key

   B. {A, B} is a superkey

   C. {A, B} is both a key and a superkey

   D. {A, B} is neither a key nor a superkey

   E. There is insufficient information to answer this question

8. (1 point) Assume that you have a relation R defined over attributes C. Moreover, $A \subseteq C$, $B \subseteq C$, and $A \rightarrow B$. Which of the following statements are true?

   A. Any two tuples of R with the same value for attributes B must also have the same value for attributes A

   B. The attributes of A are written immediately before the attributes of B

   C. $B \subseteq A$

   D. $A \cup B = C$

   E. None of the above

9. (1 point) Consider the Entity-Relationship Diagram (ERD) in Figure 3.17(d) above. Which of the following relations would arise from converting it into a BCNF-normalised relational schema?

   A. Woman(maiden_name)

   B. LivesIn(person, place)

   C. Person(last_name, first_name, sex, age)

   D. State(name, in)

   E. None of the above

10. (1 point) Consider the Entity-Relationship Diagram (ERD) in Figure 3.17(d) above. Which of the following functional dependencies are implied by the conceptual schema?

    A. continent → place_name

    B. city_name → state

    C. first_name last_name → place_name population

    D. first_name last_name → maiden_name

    E. first_name → sex

Answer Key

Question 1

A relation schema consists of a set of attributes and their data types

Question 2

studioName title → imdbRating genre leadStar

Question 3

None of the above

Question 4

S(B, C, D), T(A, C), U(A, E)

Question 5

S(A, B, C), T(B, C, D), U(A, E)

Question 6

None of the above

Question 7

{A, B} is neither a key nor a superkey

Question 8

None of the above

Question 9

None of the above

Question 10

first_name last_name → maiden_name