CS 303 - Databases & Information Systems
Quiz 2

Instructions:

1. *There are 8 questions in this question paper. All questions are compulsory.*
2. *For each question, please justify how you arrived at your answer. Incomplete answers will lead to loss of marks.*
3. *Assumptions made in each question should be clearly stated.* ***The assumption should be rational and reasonably accurate. Wild assumptions should not be considered for arriving at an answer.***
4. *DO NOT COPY.*

1. Consider an E-R diagram in which the same entity set appears several times, with its attributes repeated in more than one occurrence. Why is allowing this redundancy a bad practice that one should avoid? [2 Marks]

2. Consider a database used to record the marks that *students* get in different exams of different *course offerings*. [4 Marks]

a. Construct an E-R diagram that models *exams* as entities, and uses a ternary relationship, for the database.
b. Construct an alternative E-R diagram that uses only a binary relationship between *student* and *course offering*. Make sure that only one relationship exists between a particular *student* and *course offering* pair, yet you can represent the marks that a student gets in different exams.

3. We can convert any weak entity set to a strong entity set by simply adding appropriate attributes. Why, then, do we have weak entity sets? [3 Marks]

4. Design a generalization–specialization hierarchy for a motor vehicle sales company. The company sells motorcycles, passenger cars, vans, and buses. Justify your placement of attributes at each level of the hierarchy. Explain why they should not be placed at a higher or lower level. [2 Marks]

5. Relation R has eight attributes ABCDEFGH. Fields of R contain only atomic values. F={CH→G, A→BC, B→CFH, E→A, F→EG} is a set of functional dependencies (FDs). [5 Marks]

a. How many candidate keys does the relation R have? Please write down the candidate key(s).
b. What is the highest normal form with respect to the given set of functional dependencies.
c. Normalize the above relational schema upto 3NF.

6.Consider a relation R(A,B,C,D,E,F,G,H), where each attribute is atomic, and the following functional dependencies exist:
F = {CH -> G, A -> BC, B -> CFH, E -> A, F -> EG}

Normalize the above relational schema upto 3NF. [3 Marks]

7. Write a servlet, associated HTML code, and the relational tables (with proper columns and key constraints) for the following simple application: A user logins using userid and password and then a servlet authenticates the user (based on *user ids* and *passwords* stored in a database relation), and sets a session variable called *userid* after authentication. [5 Marks]

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8. Suppose, we decompose the schema r (A, B, C, D, E) into r1(A, B, C) and r2(A, D, E). Does the decomposition satisfy the lossless join and dependency preservation properties! Prove it. [4 Marks]