National University of Computer and Emerging Sciences

Lahore Campus

Database Systems (CS2005) Sessional-2 Exam

Date: Thu, 10 Apr 2025

Course Instructor(s)

IR, ZA, MN, AA, HI, MM, SA

Total Time (Hrs.): 1

Total Marks: 20

Total Questions: 4

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Roll No Section Student Signature

Instructions: Please ensure that you answer all questions in the given order.

SOLUTION

CLO # 3: Develop a normalized relational design to remove anomalies in a set of relations.

Q. No 1: Consider a relation R (A, B, C, D, E, F),
with the set of FDs {AB→C, BC→E, AF→D, D→B, AC→F}.
Find all possible keys (i.e. candidate keys) of this relation? Prove it. [5]

Ans: Keys are AB, AC, AD, and AF.

CLO # 3: Develop a normalized relational design to remove anomalies in a set of relations.

Q. No 2: Consider the relation schema R (A, B, C, D),
with FDs F= {AB→C, AB→D, A→B, B→D, A→C, BD→A}.
Find a minimal cover of *F* (i.e. F_c). [5]

Ans: {A→BC, B→AD} OR {A→B, B→ACD}

CLO # 3: Develop a normalized relational design to remove anomalies in a set of relations.

Q. No 3: Consider the relation R (A, B, C, D), with FDs {AB→C, BC→D, CD→A}. State which of the following decompositions of R relation are lossless decomposition. Prove it. [5]

a. R1(B, C, D) and R2(A, B, C)

b. R1(B, C, D) and R2 (A, C, D)

Ans: a) lossless as R1 ∩ R2 → R1 – R2 i.e. BC → D

b) lossless as R1 ∩ R2 → R2 – R1 i.e. CD → A

CLO # 3: Develop a normalized relational design to remove anomalies in a set of relations.

Q. No 4: Consider the relation schema R (A, B, C, D, E), with FDs F= {AB → C, D → E, B → D}. Key of this relation is AB. Identify the best normal form that R satisfies (1NF, 2NF, 3NF, or BCNF). Justify your answer. If R is not in BCNF, decompose it into a set of BCNF relations and show your steps. [5]

Ans: HNF is 1NF as FD3: B→D is PFD that violate 2NF.

BCNF Schema: R1(A, B, C), R2(B, D), R3(D, E)