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| **National University of Computer and Emerging Sciences, Lahore Campus** | | | | |
| C:\Users\saif\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Word\final design.jpg | **Course Name:** | **Database Systems** | **Course Code:** | **CS2005** |
| **Degree Program:** | **BS(computer science)** | **Semester:** | **Spring 2024** |
| **Date:** |  | **Total Marks:** | **15** |
| **Section:** | **BCS-6A** | **Type:** | **Assignment(4)** |
|  |  | **Name:**  **Roll no:** |  |
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**INSTRUCTIONS:**

**1. Handwritten Submissions: All assignments should be submitted in handwritten**

**form. This means that you should physically write out your answers, rather than**

**typing or printing them. Make sure your handwriting is clear and legible to ensure**

**that your work can be properly assessed.**

**2. No Plagiarism: Plagiarism is strictly prohibited and will result in severe penalties.**

**Ensure that your work is entirely your own . Any form of academic dishonesty,**

**including copying from classmates or using online resources without proper**

**attribution, will not be tolerated.**

**3. Submission Deadline: Assignments must be submitted on or before the specified**

**deadline. Late submissions will not be accepted, and a score of zero will be**

**awarded for assignments submitted after the due date .**

**Q1.**Consider the relation R (A, B, C, D, E, I) and a set of FDs F = { A → C, AB → C, C → DI, CD → I, EC → AB, EI → C }. Compute the minimal cover for *F* (i.e. *Fc*). Also find all possible Keys (minimal of super keys i.e. candidate keys) of R.

**Q2.**Find out whether the following set of functional dependencies for the relation R (A, B, C, D, E, G) are equivalent or not. Show all the steps. F1 = {A→C, AB→C, C→DG, CD→G, EC→AB, EG→C} and F2 = {A→C, C→D, C→G, EC→A, EC→B, EG→C}

**Q3.**Consider the relation R (A, B, C, D, E, G) and a set of FDs F = {D→E, ABC→BDE, B→G, A→C, ABC→G}. Compute the minimal cover for *F* (i.e. *Fc*). Also find all possible Keys (i.e. minimal of super keys) of R.

**Q4.**Consider the relation R (A, B, C, D, E) and a set of FDs F = {C→AB, A→E, D→E, BD→C, CD→B}. Find all possible Keys of R.

**Q5.**Consider the relation R (A, B, C, D) and a set of FDs F = {AB→C, CD→B, AD→B, AC→D}. Find all possible Keys of R.

**Q6.**Consider the relation R (A, B, C, D, E) and a set of FDs F = {A→C, C→BD, D→A}. Find all possible Keys of R.

**Q7.**Consider the relation R (A, B, C, D, E, G) and a set of FDs F = {ABC→CDEG, C→E, A→B, D→G}. Compute the minimal cover for *F* (i.e. *Fc*). Also find all possible Keys (i.e. minimal of super keys) of R.

**Q8.** (10 points) Consider a relation with schema R(A, B,C,D), with FDs F = {BC → A, AD → B, CD → B, AC → D}.

Assume possible keys of this relation are {BC}, {CD}, and {AC}. 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. Indicate which dependencies if any are not preserved by the BCNF decomposition.

**Q9.**Consider the relation R(A, B, C, D, E, F, G, H), with FDs {BC → AD, E → F, F → GH}.

1. Find all the keys for this relation R. (you don’t need to list super keys that are not keys.)
2. Identify the best normal form that R satisfies (1NF, 2NF, 3NF, or BCNF). Justify youranswer.
3. If R is not in BCNF, decompose it into a set of BCNF relations.

**Q10.**Consider the relationR(A,B.C,D,E),withFDsF={A→BC,C→D,E→D,BE→A}.

a. IsthedecompositionR1(A,E),R2(A,B,C),andR3(D,E)alosslessdecomposition?Proveit.

b. IsthedecompositionR1(A,E),R2(A,B,C),andR3(C,D)alosslessdecomposition?Proveit.