

Database Design – Practice Questions

1. Given the relation schema $R = (A, B, C, D, E)$ and the canonical cover of its set of functional dependencies

$$F_c = \left\{ \begin{array}{l} A \rightarrow BC \\ CD \rightarrow E \\ B \rightarrow D \\ E \rightarrow A \end{array} \right\}$$

Compute a lossless join decomposition in Boyce-Codd Normal Form for R . Show your steps clearly to get full marks!

2. Suppose you are given the following functional dependencies:

fd1: name \rightarrow address, gender

fd2: address \rightarrow rank

fd3: rank, gender \rightarrow salary

- a) Give a primary key of the relation $r(\text{name, address, gender, rank, salary})$. Prove your answer formally using Armstrong's Axioms.
- b) Normalize the relation $r(\text{name, address, gender, rank, salary})$ to 3rd normal form, ensuring that the resulting relations are dependency-preserving and lossless-join decompositions. Specify the primary keys in the normalized relations by underlining them.