Questions to be discussed: 1, 2, 3

1. For each of the following schema decomposition, determine whether or not it is a lossless-join decomposition.

   (a) Schema $R(A, B, C, D)$ with $F = \{A \rightarrow BCD, C \rightarrow D\}$ and decomposition $\{R1(A, B, C), R2(C, D)\}$

   (b) Schema $R(A, B, C, D)$ with $F = \{A \rightarrow BCD, C \rightarrow D\}$ and decomposition $\{R1(A, C), R2(A, B, D)\}$

   (c) Schema $R(A, B, C, D, E)$ with $F = \{AB \rightarrow C, AC \rightarrow D, E \rightarrow ABCD\}$ and decomposition $\{R1(A, B, C), R2(A, B, E), R3(A, C, D)\}$

2. Consider the schema $R(A, B, C, D, E)$ with $F = \{A \rightarrow E, AB \rightarrow D, CD \rightarrow AE, E \rightarrow B, E \rightarrow D\}$. Let $\delta = \{R1(B, D, E), R2(A, C, E)\}$ be a decomposition of R.

   (a) Is R in BCNF? Explain.

   (b) Is δ a lossless-join decomposition? Explain.

   (c) Is δ in BCNF? Explain.

   (d) If δ is not in BCNF, find a BCNF decomposition of R.

3. Consider the schema $R(A, B, C, D, E)$ with $F = \{AB \rightarrow CDE, AC \rightarrow BDE, B \rightarrow C, C \rightarrow B, C \rightarrow D, B \rightarrow E\}$. Find a BCNF decomposition of R.