1. Given relational schema \( R(ABCDE) \) with following functional dependencies:

\[
AB \rightarrow CDE, B \rightarrow C, C \rightarrow D, E \rightarrow A
\]

Determine all candidate keys and create the BCNF step by step.

2. Given following relational schema

\[
\text{car\_sale (plate\_number, seller, sale\_date, commision, discount)}
\]

with following functional dependencies:

\[
sale\_date \rightarrow discount
\]

\[
seller \rightarrow commision
\]

To which normal form does this relational schema apply? If necessary, transform the schema into 3. normal form. Is the schema minimal?

3. Given following set of functional dependencies \( \Sigma = \{ A \rightarrow B; BC \rightarrow A \} \) on the relational schema \( R(ABCD) \). Specify at least one relation \( r \) over the schema \( R \) that contradicts all functional dependencies. Explain your answer. (Assume that all attributes are of type integer.)

4. A database designer decomposed relation \( R(ABCDE) \) into relations \( R_1(ABC) \) and \( R_2(CDE) \). State at least two functional dependencies so that the decomposition is:

(a) neither lossless nor dependency preserving
(b) lossless but not dependency preserving
(c) not lossless but dependency preserving
(d) lossless as well as dependency preserving

Good Luck!