

Task 2 (0.6 mark)

Perform the following steps and save the outcomes in a file `solution2.pdf`.

- (1) Consider a relational schema $R(A, B, C, D, E)$ and the following set of functional dependencies valid in the schema,

$$\{A \rightarrow B, C \rightarrow A\}$$

List all derivations of functional dependencies that lead to the identification of minimal keys. List all minimal keys valid in a relational schema. Note, that a schema can have more than one minimal key.

$$\begin{aligned} C \rightarrow A \text{ and } A \rightarrow B &\Rightarrow C \rightarrow B \\ C \rightarrow A \text{ and } C \rightarrow B &\Rightarrow C \rightarrow AB \\ C \rightarrow AB &\Rightarrow CDE \rightarrow AB \end{aligned}$$

minimal key = (CDE)

- (2) Consider a relational schema $R(A, B, C, D, E)$ and the following set of functional dependencies valid in the schema,

$$\{A \rightarrow E, E \rightarrow C, CD \rightarrow A\}$$

List all derivations of functional dependencies that lead to the identification of minimal keys. List all minimal keys valid in a relational schema. Note, that a schema can have more than one minimal key.

$$\begin{aligned} CD \rightarrow A \text{ and } A \rightarrow E &\Rightarrow CD \rightarrow E \\ CD \rightarrow A \text{ and } CD \rightarrow E &\Rightarrow CD \rightarrow AE \\ CD \rightarrow AE &\Rightarrow BCD \rightarrow AE \end{aligned}$$

minimal key 1 = (BCD)

$$\begin{aligned} A \rightarrow E \text{ and } E \rightarrow C &\Rightarrow A \rightarrow C \\ A \rightarrow C \text{ and } A \rightarrow E &\Rightarrow A \rightarrow CE \\ A \rightarrow CE &\Rightarrow ABD \rightarrow CE \end{aligned}$$

minimal key 2 = (ABD)

$$\begin{aligned} E \rightarrow C &\Rightarrow DE \rightarrow CD \\ DE \rightarrow CD \text{ and } CD \rightarrow A &\Rightarrow DE \rightarrow A \\ DE \rightarrow CD \text{ and } DE \rightarrow A &\Rightarrow DE \rightarrow ACD \\ DE \rightarrow ACD &\Rightarrow BDE \rightarrow ACD \end{aligned}$$

minimal key 3 = (BDE)

- (3) Consider a relational schema $R(A, B, C, D, E)$ and the following set of functional dependencies valid in the schema,

$\{D \rightarrow A, DA \rightarrow B, DE \rightarrow ABC\}$

List all derivations of functional dependencies that lead to the identification of minimal keys. List all minimal keys valid in a relational schema. Note, that a schema can have more than one minimal key.

$DE \rightarrow ABC$

minimal key = (DE)
