

Homework 5

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| Due | Oct 24 by 11:59pm | Points | 50 | Submitting | a file upload | File Types | pdf, txt, and docx | Available | Oct 17 at 12am - Oct 24 at 11:59pm 8 days |
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This assignment was locked Oct 24 at 11:59pm.

Part 1

For the first three questions, use the below relation and known functional dependencies.

Relation

Route(*ArrivalTime*, *DepartureTime*, *Location*, *Bus*)

Functional Dependencies

$\{DepartureTime, Location\} \rightarrow \{Bus\}$

$\{ArrivalTime\} \rightarrow \{DepartureTime\}$

$\{Bus, ArrivalTime\} \rightarrow \{Location\}$

Question 1

20 points - Compute the closure of all sets of attributes.

Question 2

5 points - Using the closures from Question 1, identify the keys for the relation *Route*. Remember we want minimal keys, not just any superkey.

Question 3

10 points - Using the closures from Question 1, list all non-trivial functional dependencies for the relation *Route*.

Part 2

For the below relation and known dependencies to answer Questions 4 and 5.

Relation

Shuttle(*DepartureTime*, *Route*, *Driver*, *Bus*, *Capacity*)

Functional Dependencies $\{Bus, DepartureTime\} \rightarrow \{Driver\}$ $\{Bus\} \rightarrow \{Capacity\}$ $\{Route, DepartureTime\} \rightarrow \{Bus\}$

Question 4

5 points - For each of the three provided functional dependencies above, $X \rightarrow Y$, compute X^+ . Once you have the closures computed, identify the key(s) for the relation *Shuttle*.

Question 5

10 points - From Question 4, we can see that **Bus** \rightarrow **Capacity** is a violation of Boyce-Codd Normal Form (BCNF). Decompose the relation *Shuttle* into BCNF relations, starting with this dependency violation.

- Show each iteration in your work, and make clear which relations are your resulting BCNF relations.
- Identify the key in each of the resulting BCNF relations.

Submission

Please submit your work online. Word documents or PDFs are accepted, as well as simple text files, where you can use "->" for your dependencies and "+" for your closure notation.

| Homework 5 Rubric | | | |
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| Criteria | Ratings | | Pts |
| Question 1 | 20.0 pts Full Marks | 0.0 pts No Marks | 20.0 pts |
| Question 2 | 5.0 pts Full Marks | 0.0 pts No Marks | 5.0 pts |
| Question 3 | 10.0 pts Full Marks | 0.0 pts No Marks | 10.0 pts |
| Question 4 | 5.0 pts Full Marks | 0.0 pts No Marks | 5.0 pts |
| Question 5 | 10.0 pts Full Marks | 0.0 pts No Marks | 10.0 pts |
| | | | Total Points: 50.0 |