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Cpts 451

HW 5

**Question 1.a.**

**Closures:**

**The Non-Trivial FD’s are :**

**AB 🡪 C, C 🡪 D, D 🡪 A, C 🡪 A, AB 🡪 D, AC 🡪 D, BC 🡪 D, BC 🡪 A, BD 🡪 A, BD 🡪 C, CD 🡪 A, ABC 🡪 D, ABD 🡪 C, BCD 🡪 A**

**Question 1.b.**

**The minimal keys are AB, BC, and BD.**

**Question 2.a.**

**Closures:**

**The minimal keys are:**

**C**

**Question 2.b.**

The FD’s that violate BCNF conditions are B 🡪 A and B 🡪 D

**Question 2.c.**

R1(A,B), R2(B,C,D)

FD’s for R1

FD’s for R1 : B 🡪 A

FD’s for R2

FD’s for R2 : B 🡪 D, C 🡪 B, C 🡪 D, BC 🡪 D, CD 🡪 B

FD B 🡪 D violates BCNF, further decomposition of R2(B,C,D)

R3(B,D), R4(B,C)

FD’s for R3

FD’s for R3 : B 🡪 D

FD’s for R4

FD’s for R4 : C 🡪 B

**Results:**

**R1(A,B) : B 🡪 A**

**R3(B,D) : B 🡪 D**

**R4(B,C) : C 🡪 B**

**Question 2.d.**

Yes, the decomposition from part c reserved functional dependencies.

**Question 2.e.**

No, we will get different results, R1 will be R1(A,B,D) and R2 will be R2(B,C)

FD of R2(B,C) will be C 🡪 B

FD’s of R1(A,B,D)

FD’s of R1(A,B,D) will be B🡪A, B🡪D, AB🡪D, BD🡪A

As we can see from the above we get two additional functional dependencies AB🡪D and BD🡪A this is different from if we decomposed with B🡪A. We also only had to decompose once.

**Question 2.f.**

No, we cannot decompose to C 🡪 B because C is a minimal key and therefore does not violate BNCF.

**Question 3.a.**

The rest of the pairs do not produce minimal keys or super keys, so I’m moving on to triples.

**The minimal keys are :**

**ABC, ABD, ABE**

**Question 3.b.**

The FD’s that violate BCNF are D 🡪 C, BC 🡪 E, AE 🡪 D

**Question 3.c.**

R1(C, D), R2(A,B,D,E)

FD of R1

FD of R1 : D 🡪 C

FD’s of R2

FD’s of R2 : AE 🡪 D, ABE 🡪 D

FD AE 🡪 D violates BCNF, further decomposition

R3(A,D,E), R4(A,B,E)

FD’s of R3

FD’s of R3 : AE 🡪 D

FD’s of R4

FD’s of R4 : None

**Results :**

**R1(C, D) : D 🡪 C**

**R3(A,D,E) : AE 🡪 D**

**R4(A,B,E) : None**

**Question 3.d.**

R1(B,C,E), R2(A,B,C,D)

FD’s of R1

FD of R1 : BC 🡪 E

FD’s of R2

FD’s of R4 : D 🡪 C, AD 🡪 C, BD 🡪 C, ABD 🡪 C

FD D🡪 C Violates BCNF, further decomposition

R3(D,C), R4(A,B,D)

FD of R3 : D🡪C

FD’s of R4

FD of R4 : None

**Results :**

**R1(B,C,E) : BC 🡪 E**

**R3(D,C) : D🡪 C**

**R4(A,B,D) : None**

No, the set of relations is different.

**Question 3.e.**

The composition in part c did not preserve the FD’s because the FD BC 🡪 E is gone after decomposition. The composition in part d did not preserve the FD’s because the FD AE 🡪 D is gone after decomposition.

**Question 4.**

**Table of S(A,B,C) :**

|  |  |  |
| --- | --- | --- |
| A | B | C |
| A1 | B1 | C1 |
| A2 | B2 | C2 |
| A3 | B2 | C3 |

**Table of S1(A,B) :**

|  |  |
| --- | --- |
| A | B |
| A1 | B1 |
| A2 | B2 |
| A3 | B2 |

**Table of S2(B,C) :**

|  |  |
| --- | --- |
| B | C |
| B1 | C1 |
| B2 | C2 |
| B2 | C3 |

**Table of S1 join S2 :**

|  |  |  |
| --- | --- | --- |
| A | B | C |
| A1 | B1 | C1 |
| A2 | B2 | C2 |
| A2 | B2 | C3 |
| A3 | B2 | C2 |
| A3 | B2 | C3 |

B2 is common for B so when joining it created more tuples for the case of C2 and C3 thus making S1 join S2 not equal to S.