CSE 344 Section 6 Worksheet

1. Given R(A, B, C, D, E, F) and FDs: B → A, E → B, D → C, A → C

Decompose R into BCNF. In each step, explain which functional dependency you used to decompose and explain why further decomposition is needed. Your answer should consist of a list of table names and attributes. Make sure you indicate the keys for each relation.

1. Use B → A, A → C
Decompose R into R1(B, A, C) and R2(B, D, E, F)

R1 violates A → C, so we need to further decompose R1
R2 violates E → B, so we need to further decompose R2

2. Use A → C
Decompose R1 into R11(A, C) and R12(A, B)

3. Use E → B
Decompose R2 into R21(E, B) and R22(E, D, F)

Final Decompositions: R11(A, <u>B</u>), R12(<u>A</u>, C), R21(<u>E</u>, B), R22(E, D, F)

2. *(17WI Final Q4)* Given R(A, B, C, D, E), and FDs: A → C, BD → A, D → E

Decompose R into BCNF. In each step, explain which functional dependency you used to decompose and explain why further decomposition is needed. Your answer should consist of a list of table names and attributes. Make sure you indicate the keys for each relation.

One possible decomposition:
1. Use A → C:
Decompose R into R1(A, C) and T(A, B, D, E)

T violates BD → A and D → E, so we need to further decompose T

2. Use D → E:
Decompose T into R2(B, D, A) and R3(D, E)

Final relations: R1(<u>A</u>, C), R2(<u>B, D</u>, A), and R3(<u>D</u>, E)

3. Consider these three transactions:
- *T1 : R1(A), R1(B), W1(A), W1(B), Co1*
- *T2 : R2(B), W2(B), R2(C), W2(C), Co2*
- *T3 : R3(C), W3(C), R3(A), W3(A), Co3*

a. Schedule 1:
R2(B), W2(B), R3(C), W3(C), R3(A), W3(A), Co3, R2(C), W2(C), Co2, R1(A), R1(B), W1(A), W1(B), Co1

Is this schedule conflict-serializable? If yes, indicate a serialization order.

Solution: yes: 3,2,1

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1 <--B-- 2 <--C-- 3
^                 |
+--------A--------+
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b. Schedule 2:
R2(B), W2(B), R3(C), W3(C), R1(A), R1(B), W1(A), W1(B), Co1, R2(C), W2(C), Co2, R3(A), W3(A), Co3

Is this schedule conflict-serializable? If yes, indicate a serialization order.

Solution: no

```
1 <--B-- 2 <--C-- 3
|                 ^
+--------A--------+
```

4. Consider the following three transactions:

- *T1 : R1(A), W1(B), Co1*
- *T2 : R2(B), W2(C), Co2*
- *T3 : R3(C), W3(D), Co3*

Give an example of a conflict-serializable schedule that has the following properties: transaction T1 commits before transaction T3 starts, and the equivalent serial order is T3, T2, T1.

Solution: R1(A), R2(B), W1(B), Co1, R3(C), W2(C), Co2, W3(D), Co3
Variations include: swap the first two reads (of A and B), and the last two writes (of C and D, together with the commit order)