Haridas Aravind – 02071139

Given the relation with the following attributes ACFSBDM.

Note that C is the key. This relation has this set of functional dependencies: FS -> B, A ->D.

a) Explain why this relation is not in BCNF. (20 points possible)

b) Decompose this relation into BCNF. (80 points possible)

a) The given relation has attributes ACFSBDM, with C as the key, and functional dependencies FS -> B and A -> D. To determine if the relation is in Boyce-Codd Normal Form (BCNF), we need to check if for every functional dependency X -> Y, X is a super key.

1

For the functional dependency FS -> B:

FS is not a super key, as the key is C.

For the functional dependency A -> D:

A is not a super key, as the key is C.

Since neither of the functional dependencies has a super key on the left side, the relation is not in BCNF.

b) To decompose the relation into BCNF, we can follow these steps:

Identify a functional dependency that violates BCNF. In this case, we can choose FS -> B.

Decompose the relation into two relations: one containing the attributes involved in the violating functional dependency (FSB) and the other containing the remaining attributes (ACDM).

Check if the decomposed relations are in BCNF. If not, repeat the process.

Now we have two relations: FSB and ACDM.

For the relation FSB with the functional dependency FS -> B:

FS is a super key, as it determines B.

For the relation ACDM with the functional dependency A -> D:

A is not a super key, as the key is C.

Since the relation ACDM is not in BCNF, we need to decompose it further.

Identify a functional dependency that violates BCNF.

In this case, we can choose A -> D.

Decompose the relation ACDM into two relations: one containing the attributes involved in the violating functional dependency (AD) and the other containing the remaining attributes (CM).

Check if the decomposed relations are in BCNF. If not, repeat the process.

Now we have two relations: AD and CM.

For the relation AD with the functional dependency A -> D:

A is a super key, as it determines D.

For the relation CM with no functional dependencies:

There are no functional dependencies to violate BCNF.

All decomposed relations (FSB, AD, and CM) are now in BCNF. The final decomposition is FSB, AD, and CM.