**DATABASE SYSTEMS HOMEWORK 3**

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1. BCS -> MN, BCT, LID (given)

2. BS -> BPD, BTN (given)

3. BTN -> BC, BV, BA (given)

4. BCS, BTN -> CT (given)

5. LID -> LN (given)

Proof of Uniqueness

6. BCS -> LN (proj 1,5)

7. BCS, BS -> CT (aug 2)

8. BS -> BC, BV, BA (proj 2,3)

9. BCS -> MN, BCT, LID, LN (Add 1, 6)

10. BS -> BPD, BC, BV, BA (Add 2, 8)

11. BCS, BS -> BPD, BC, BV, BA (aug 10)

12. BCS, BS -> MN, BCD, LID, LN (aug 9)

13. BCS, BS -> BCS, BS (reflex)

14. BCS, BS -> BPD, BC, BV, BA, MN, BCT, LID, LN, (add 11, 12)

15. BCS, BS -> BCS, BS, BPD, BC, BV, BA, MN, BCT, LID, LN, BTN, CT (add 12, 14)

2. Putting the database in 2NF - the relations contains no partial dependencies

R1. (**Battery Charger Serial**, Manufacturer Name, Battery Charger Type, Location ID, Location Name)

R2 (**Battery Serial**, Battery Purchased Date, Battery Chemistry, Battery Voltage, Battery Amperage, Battery Type Name)

R3. (**Battery Charger Serial, Battery Type Name,** Charge Time)

b. Putting the Database in 3NF – Removing Transitive Dependencies

R1a. (**Battery Charger Serial**, Manufacturer Name, Battery Charger Type, Location ID)

Since location name depend on Location ID only split :

R1b (**Location ID**, Location Name)

R2a (**Battery Serial**, Battery Purchased Date, Battery Type Name)

Because Battery Chemistry, Battery Voltage, Battery Amperage depend only on Battery Type Name:

R2b (**Battery Type Name**, Battery Chemistry, Battery Voltage, Battery Amperage)

R3. (**Battery Charger Serial, Battery Type Name**, Charge Time)

Rule: A relation in 2NF with only one non-key attribute must be in 3NF

c. Putting the Database in BCNF – Every determinant is a candidate key.

Stays same as 3NF above because :

\* In all instances above, nowhere is all the left hand side in a relation containing at least on of the attributes on the right hand from the same relation.

For instance, in R2b above, Yes R2a contains Battery Type Name, but doesn’t contain any of

Battery Chemistry, Battery Voltage or Batter amperage. Same for all other relations. Therefore,

I assume they are all in 3NF