Spring 2016, CS122A, UC Irvine, Quiz 7, Prof. Chen Li

Quiz 7   Student ID:_____   Name:_____   Score (out of 9):_____

1. Let the relation R(A, B, C, D, E) has functional dependency set F={AB->C, BC->D, CD->E}. E is
   not functionally dependent on which of the following?
   (a) AB (b) BC **(c) AC** (d) CE

2. Consider the entity Student(ID, Name, PL). Here PL stands for the programming languages that
   a student knows. If PL is a multi-valued attribute, 1NF is violated. **(a) Yes** (b) No
   (By definition, a column in a 1NF table cannot have multiple values)

3. The IRS maintains the following table to keep track of 2016 taxes for every person:
                           R(SSN, Income, Tax, Refund).
   In addition to SSN being the key, we have the FDs: (1) Income->Tax; and (2) Tax->Refund.
   (i) Does R violate 2NF? Why?
   (a) Yes **(b) No**
   (Since there is no non-prime attribute depending on a proper subset of the key)
   (ii) Does R violate 3NF? Why?
   (a) Yes (b) No
        (Note that we have transitive dependency among non-prime attributes:
   Income->Tax->Refund and by definition, this is not 3NF)
   (iii) Does R violate BCNF? Why?
   (a) Yes (b) No
        (For BCNF, recall: "Everything depends on the key, the whole key, and nothing but
   the key". Also if 3NF is violated, BCNF is automatically violated.)

4. Let relation R(A, B, C, D, E, F, G) have FDs {AB->C, CD->E, F->B}. Determine a set of the
   attributes that could potentially be a key.
   ADFG
   (Since these don't have any incoming edges; also, note that F->B violates 2NF)

5. Let relation R(A, B, C, D, E) have FDs {AB->C, AB->D, CD->A, CD->B}. Does R violate:
        (a) 2NF? Yes/**No**
        (b) 3NF? Yes/**No**
        (c) BCNF? **Yes**/No
        (Since ABE is a key and CDE is also a key and note that there a dependency AB->C
   which violates BCNF, by definition)

1