Course code:CS309

Information and Database Systems

Assignment 6

Instructor: Dr. Rohit Saluja

Questions 1-3 are of 10 marks. Q4 is 20 marks.

1. R (S, T, U, V, W, X, Y, Z) is a relation where the following functional dependencies exist (where every attribute is atomic):

    UZ → Y

    S → TU

    T → UXZ

    W → S

    X → WY

    Is the above relation R in 3NF, if not why. Is it in 2NF? Explain with proper justification and find the appropriate Normal Form for relation R.

2. R (M, N, O, P) is a relation with following functional dependencies:

    M → N

    N → O

    O → P

$P \rightarrow N$

Explain whether the decomposition of R into (M,N), (N,O), (N,P) is dependency preserving.

3. Write a python code to find closure of attributes and corresponding FDs (find A^+ and F^+) given in via string and dictionary below:

R = 'ABCDE' # A-E are 5 different attributes

F = {'A':'B', 'B':'C', 'C':'D'} #'A':'B' => A -> B and so on

4. Write python code in similar manner as question 3 (FDs as a dictionary, and relations as string of attributes) to solve the following problem.
(Represent relations using string name as relation name and attributes as its values.
E.g. Universal relation below can be represented as R = 'ABCDEFGHIJ')

Consider the universal relation R = {A, B, C, D, E, F, G, H, I, J} and the set of functional dependencies: F = {{A, B}→{C}, {A}→{D, E}, {B}→{F}, {F}→{G, H}, {D}→{I, J}}.

Determine whether following decompositions are dependency preserving using the two algorithms discussed in class.

Also determine NF for each relation Ri is in? (<u>python code not needed for this part, just mention NF in the answer/solutions</u>)

a) R1 = {A, B, C}, R2 = {A, D, E}, R3 = {B, F}, R4 = {F, G, H}, R5 = {D, I, J}
b) R1 = {A, B, C, D}, R2 = {D, E}, R3 = {B, F}, R4 = {F, G, H}, R5 = {D, I, J}

AB -> DE

AB -> C

ABC -> DE

C -> F

a1 b1 c1 d1 e1 f1

a1 b1 c1 d1 e1 f2