

Delhi Technological University
Department of Applied Mathematics
MC-302 Database Management System

Assignment -2

Question 1: Consider the relation shown in the following table. List all the functional dependencies that this relation instances satisfy.

X	Y	Z
x1	y1	z1
x2	y1	z2
x1	y2	z2
x2	y1	z2

Question 2: Given the following set S of functional dependencies:

M → O (F1)

NP → M (F2)

O → N (F3)

Check and prove if the following dependencies can be deduced from S. If not, give a counter-example with 5 tuples or less.

- A) OP → M
- B) NO → M
- C) MP → N
- D) MO → P
- E) MN → P

Question 3: Consider the relation schema R(A, B, C, D) with functional dependencies A → D, B → CD and AC → D.

- A) Find the attribute closure {A}⁺.
- B) Find the attribute closure {A, B}⁺.
- C) Find the minimum cover (i.e. canonical cover) of the given functional dependencies.
- D) List all the candidate key(s) of R.

Question 4: Consider the relation schema R(A, B, C, D, E, G) with functional dependencies F = {AB → C, AG → E, B → D, E → G}. Notice F is the minimum cover of itself.

For each of the following decompositions $R(A, B, C, D, E, G)$, determine whether it is (a) dependency-preserving, and (b) lossless.

- i) {ABC, CDE, EG}
- ii) {ABCD, AEG}
- iii) {ABCE, BD, AEG}
- iv) {AB, ADE, BCG}
- v) {BDEG, ABC}

Question 5: Consider the relation schema $R(A, B, C, D)$ with functional dependencies $A \rightarrow B$, $BC \rightarrow A$ and $B \rightarrow D$, which is the minimum cover itself.

- A) Find all the candidate key(s) of R .
- B) Is relation R in BCNF? Is it in 3NF? Justify your answers.
- C) Decompose the relation $R(A, B, C, D)$ into a collection of BCNF relations, so that the decomposition is lossless. Is the decomposition dependency-preserving?
- D) Decompose the relation $R(A, B, C, D)$ into a collection of 3NF relations, so that the decomposition is both lossless and dependency-preserving.