

PDPM

**INDIAN INSTITUTE OF INFORMATION TECHNOLOGY,
DESIGN & MANUFACTURING, JABALPUR**

**DBMS
Assignment 12**

Note: Give reasons in support of your answer.

- 1 Suppose we have two relations $R(\underline{A}, B)$ and $S(\underline{A}, B)$ with the same schema. The only key of R is $\{A\}$; the only key of S is $\{A\}$ as well. Let relation $T(A, B)$ be the set union of R and S , i.e., $T = R \cup S$. What are the keys of T ?

- (i) $\{A\}$
- (ii) $\{B\}$
- (iii) $\{A\}$ and $\{B\}$
- (iv) $\{A, B\}$

- 2 In the instance of relation $R(A, B, C, D, E)$ shown below, which of the following functional dependencies hold?

<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>
1	2	3	4	5
1	4	3	4	5
1	2	4	4	1

FDs are: $AB \rightarrow C$, $B \rightarrow D$, $DE \rightarrow A$

3. Suppose we have a relation $R(A, B, C, D)$ with the FD's:

$A \rightarrow B$, $B \rightarrow C$, $C \rightarrow D$

Which one of the following decompositions is not lossless?

- (a). $R_1(A, B)$, $R_2(B, C)$, $R_3(C, D)$
- (b). $R_1(A, B)$, $R_2(A, C)$, $R_3(C, D)$
- (c). $R_1(A, D)$, $R_2(B, D)$, $R_3(C, D)$
- (d). None of the above

- 4 Suppose we have a relation $R(A, B, C)$. For each of the three conditions described below, give an example of a set of functional dependencies that makes the statement true. Indicate the keys of R and explain briefly why the condition holds.

- (i) R is in BCNF.
- (ii) R is in 3NF but not in BCNF.
- (iii) R is not in 3NF.

- 5 Consider the following relational schema:

SALE (CLERK, STORE, CITY, DATE, ITEM#, SIZE, COLOR)

// records that a clerk sold an item on a particular day

ITEM (ITEM#, SIZE, COLOR, PRICE)

// records prices and available sizes and colors for items

Make the following assumptions, and only these assumptions, about the real world being modeled:

- Each clerk works in one store.
- Each store is in one city.
- A given ITEM# always has the same price, regardless of size or color.
- Each item is available in one or more sizes and one or more colors, and each item is available in all combinations of sizes and colors for that item.

- (a) Based on the assumptions above (and no others), specify all keys for relations SALE and ITEM.
- (b) Based on the assumptions above (and no others), specify an appropriate set of completely nontrivial functional dependencies for relations SALE and ITEM.
- (c) Are relations SALE and ITEM in BCNF? If not, decompose the relations so they are in BCNF.
- (d) Now consider your decomposed relations from part (c) or the original relations if you did not need to decompose them for part (c). Based on the assumptions above (and no others), specify all nontrivial multivalued dependencies for the relations. Do not include multivalued dependencies that also are FDs.
- (e) Are the relations you use in part (d) in 4NF? If not, decompose the relations so they are in 4NF.