Data Base CP  
22L-7986

INVOICE

HILLTOP ANIMAL HOSPITAL DATE: JAN 13/2002

INVOICE # 987

MR. RICHARD COOK

123 THIS STREET

MY CITY, ONTARIO

Z5Z 6G6

PET PROCEDURE AMOUNT

ROVER RABIES VACCINATION 30.00

MORRIS RABIES VACCINATION 24.00

TOTAL 54.00

TAX (8%) 4.32

AMOUNT OWING 58.32  
  
  
Ans)  
  
**Un normalized Form (UNF):**

The UNF table combines all information into a single table, including invoice details (such as number, date, customer information), procedure details (name and amount), resulting in data redundancy and potential update anomalies.

**First Normal Form (1NF):**

In 1NF, the table is split into two tables: INVOICE and PROCEDURE. The INVOICE table contains invoice details, and the PROCEDURE table contains procedure details. Each table has a primary key (invoice number for INVOICE, and a combination of invoice number and procedure for PROCEDURE) and no repeating groups, satisfying 1NF.

**Second Normal Form (2NF):**

To achieve 2NF, we further split the PROCEDURE table into two tables: PROCEDURE and PROCEDURE\_TYPE. The PROCEDURE table contains the relationship between invoice numbers and procedure types (identified by procedure ID), while the PROCEDURE\_TYPE table lists the procedure types. This eliminates partial dependencies and ensures that each table represents a single theme.

**Third Normal Form (3NF):**

In 3NF, we introduce a CUSTOMER table to separate customer information from the INVOICE table. The INVOICE table now contains only the invoice number, date, and customer ID, which references the CUSTOMER table. This eliminates transitive dependencies and ensures that each table contains only information relevant to its primary key.   
  
**UNF:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **invoice\_number** | **date** | **customer\_name** | **street** | **city** | **province** | **postal\_code** | **procedure** | **amount** |
| 987 | JAN 13/2002 | MR. RICHARD  COOK | 123 THIS STREET | MY CITY | ONTARIO Z5Z | 6G6 | ROVER RABIES VACCINATION | 30.00 |
| 987 | JAN 13/2002 | MR. RICHARD COOK | 123 THIS STREET | MY CITY | ONTARIO Z5Z | 6G6 | MORRIS RABIES VACCINATION | 24.00 |

**1NF**  
Invoice table

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **invoice\_number** | **date** | **customer\_name** | **street** | **city** | **province** | **postal\_code** |
| 987 | JAN 13/2002 | MR. RICHARD  COOK | 123 THIS STREET | MY CITY | ONTARIO Z5Z | 6G6 |

|  |  |  |
| --- | --- | --- |
| **invoice\_number** | **procedure** | **amount** |
| 987 | ROVER RABIES VACCINATION | 30.00 |
| 987 | MORRIS RABIES VACCINATION | 24.00 |

Procedure table  
  
  
  
  
  
  
  
  
  
  
**2NF**Invoice table

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **invoice\_number** | **date** | **customer\_name** | **street** | **city** | **province** | **postal\_code** |
| 987 | JAN 13/2002 | MR. RICHARD COOK | 123 THIS STREET | MY CITY | ONTARIO | Z5Z 6G6 |

Procedure table:

|  |  |
| --- | --- |
| **procedure\_id** | **procedure** |
| 1 | ROVER RABIES VACCINATION |
| 2 | MORRIS RABIES VACCINATION |

INVOICE\_PROCEDURE table:

|  |  |  |
| --- | --- | --- |
| invoice\_number | procedure\_id | amount |
| 987 | 1 | 30.00 |
| 987 | 2 | 24.00 |

**3NF**Invoice table

|  |  |  |
| --- | --- | --- |
| **invoice\_number** | **date** | **customer\_id** |
| 987 | JAN 13/2002 | 1 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **customer\_id** | **customer\_name** | **street** | **city** | **province** | **postal\_code** |
| 1 | MR. RICHARD COOK | 123 THIS STREET | MY CITY | ONTARIO | Z5Z 6G6 |

Customer Table  
  
  
  
  
  
Procedure table

|  |  |
| --- | --- |
| **procedure\_id** | **procedure** |
| 1 | ROVER RABIES VACCINATION |
| 2 | MORRIS RABIES VACCINATION |

INVOICE\_PROCEDURE table:

|  |  |  |
| --- | --- | --- |
| invoice\_number | procedure\_id | amount |
| 987 | 1 | 30.00 |
| 987 | 2 | 24.00 |