1. Submit a **printed 3NF solution** for EACH user view in this assignment

2. You are to show **each step** in your solution: **UNF, 1NF, 2NF, 3NF**  .

3. You are to clearly **mark Primary and Foreign Keys** as shown in the sample below:

**Relation1[ column1 (PK), column2, column3, column4 (FK) ]**

4. Show the **FINAL ENTITY SET** after performing **MERGE** operation on your five 3NF solutions

#### **GTA Landscaping: User View 1**

Below are shown 2 sample invoices for the **services our business sells**. (An invoice is the same as a receipt). We write a **customer invoice once all services are completed for a customer visit**. This invoice will itemize many details including the services provided, the time it took to complete those services, the charge for those services, the total of all service charges.

**Sample1**

**Invoice Statement**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **INVOICE #:** | *1355* |  |  |  |
| **INVOICE DATE:** | *5-Jul-19* |  | **CUSTOMER:** | *56 - John Adams* |
| **WORK TEAM:** | *2* |  | **ADDRESS:** | *234 Bloor W* |
| **EQUIP. USED:** | *20 hp John Deer tractor/ mower* | | | *Toronto* |
|  | *10" tree pruning shears* | |  | *M2S 4S3* |
|  | *2 hp Johnson grass trimmer* | |  |  |
|  |  |  |  |  |
| **SERVICES:** |  |  |  |  |
| **SERVICE CODE** | **DESCRIPTION** | **HOURLY CHARGE** | **WORK DURATION (hours)** | **TOTAL CHARGE** |
| *LC* | *Lawn Cutting* | *$25.00* | *0.75* | *$18.75* |
| *LW* | *Lawn Weeding* | *$35.00* | *1.15* | *$40.25* |
| *LF* | *Lawn Fertilizing* | *$15.00* | *0.25* | *$3.75* |
| *TG* | *Tree Pruning* | *$45.00* | *0.50* | *$22.50* |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  | **SUBTOTAL:** | *$85.25* |
|  |  |  | **GST (7%):** | *$5.97* |
|  |  |  | **PST (8%):** | *$6.82* |
|  |  |  | **TOTAL DUE:** | *$98.04* |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

**Sample2**

**Invoice Statement**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **INVOICE #:** | *1412* |  |  |  |
| **INVOICE DATE:** | *04-Jul-19* |  | **CUSTOMER:** | *34 - Ashley Riley* |
| **WORK TEAM:** | *3* |  | **ADDRESS:** | *156 Avindale Cresc* |
| **EQUIP. USED:** | *20 hp John Deer tractor/ mower* | | | *Toronto* |
|  | *2 hp Johnson grass trimmer* | |  | *M4T 4R7* |
|  | *Haggmann garden-tiller* |  |  |  |
| **SERVICES:** |  |  |  |  |
| **SERVICE CODE** | **DESCRIPTION** | **HOURLY CHARGE** | **WORK DURATION (hours)** | **TOTAL CHARGE** |
| *LC* | *Lawn Cutting* | *$25.00* | *0.75* | *$18.75* |
| *GW* | *Garden Weeding* | *$25.00* | *1.15* | *$28.75* |
| *GP* | *Garden Planting* | *$30.00* | *0.25* | *$7.50* |
| *GF* | *Garden Fertilizing* | *$10.00* | *0.50* | *$5.00* |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  | **SUBTOTAL:** | *$60.00* |
|  |  |  | **GST (7%):** | *$4.20* |
|  |  |  | **PST (8%):** | *$4.80* |
|  |  |  | **TOTAL DUE:** | *$69.00* |
|  |  |  |  |  |

1V.UNF:

INVOICE[ **Inv\_Num**, Inv\_Date, Work\_Team, (Equip\_ID ,Equip\_Desc),Cust\_Num,Cust\_Name, Cust\_ Address, Service\_Code, Desc, Hourly\_Charge, Work\_Duration)]

1V.1NF:

INVOICE[ **Inv\_Num**, **Service\_Code, Equip\_ID**, **Cust\_Num,** Inv\_Date, Work\_Team, Equip\_Desc, Cust\_Name, Cust\_ Address, Desc, Hourly\_Charge, Work\_Duration]

1V.2NF:

INVOICE[ **Inv\_Num, Service\_Code(FK), Equip\_ID(FK), Cust\_Num(FK),** Inv\_Date, Work\_Team]

SERVICE[**Service\_Code**, Desc, Hourly Charge, Work\_Duration]

EQUIPMENT[**Equip\_ID**,Equip\_Desc]

CUSTOMER[**Cust\_Num**, Cust\_Name, Cust\_ Address]

1V.3NF:

INVOICE[ **Inv\_Num**, **Service\_Code(FK), Equip\_ID(FK), Cust\_Num(FK),** Inv\_Date, Work\_Team]

SERVICE**[Service\_Code**, Desc, Hourly Charge, Work\_Duration]

EQUIPMENT[**Equip\_ID**,Equip\_Desc]

CUSTOMER[**Cust\_Num**, Cust\_Name, Cust\_ Address]

#### ***GTA Landscaping: User View 2***

Below is a listing of GTA Landscaping teams of lawn care specialists that do the services for our customers. The Operations Manager uses this report to schedule which teams will be sent to which customers on any given work day. Team members work together when visiting a customer site.

**Team - Employee Reports**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **TEAM** | **DESCRIPTION** |  |  |  |  |  |
| 1 | General Contracting | |  |  |  |  |
|  |  |  |  |  |  |  |
| **POSITION** | **NAME** | **EMP ID:** | **OHIP** | **HOME PHONE** | **START DATE** | **SKILLS** |
| Supervisor | Cindy Lee | 120 | 219032002 | 905-338-1234 | 1-Jan-98 | Electrical , |
|  |  |  |  |  |  | Plumbing , |
|  |  |  |  |  |  | General Contractor |
| Lawn Care | Amy Smith | 122 | 34111991 | 905-338-1234 | 30-Jun-99 | Irrigation , |
|  |  |  |  |  |  | Lawn Maintenance |
|  |  |  |  |  |  |  |
| **TEAM** | **DESCRIPTION** |  |  |  |  |  |
| 2 | Pruning and Planting | |  |  |  |  |
|  |  |  |  |  |  |  |
| **POSITION** | **NAME** | **EMP ID:** | **OHIP** | **HOME PHONE** | **START DATE** | **SKILLS** |
| Lawn Care | Paula Corelli | 121 | 325443001 | 416-458-4562 | 30-Jun-98 | Pruning , |
|  |  |  |  |  |  | Irrigation , |
|  |  |  |  |  |  | Fertilizing |
| Supervisor | Paul Huang | 123 | 54222991 | 416-932-4533 | 30-Jun-05 | "A" License , |
|  |  |  |  |  |  | Electrical , |
|  |  |  |  |  |  | General Contractor |
|  |  |  |  |  |  |  |
| **TEAM** | **DESCRIPTION** |  |  |  |  |  |
| 3 | General Maintenance | |  |  |  |  |
|  |  |  |  |  |  |  |
| **POSITION** | **NAME** | **EMP ID:** | **OHIP** | **HOME PHONE** | **START DATE** | **SKILLS SID** |
| Lawn Care | Maria Wong | 124 | 43524532 | 905-345-5366 | 23-Aug-98 | Pruning , S5 |
|  |  | 124 |  |  |  | Lawn Maintenance s2 |
| Supervisor | Phil Ramirez | 126 | 32543555 | 416-435-6599 | 3-Mar-17 | Irrigation , s4 |
|  |  |  |  |  |  | Plumbing ,S1 |
|  |  |  |  |  |  | Electrical |

\*Concat. PK is emp\_id & position OR team & emp\_id & surrogate PK(Skill\_Num) for Skills for TeamEmp

2V. UNF:

TEAMEMP( **Team\_Num**, Team \_Desc,( Position, Emp\_Name, Emp\_ID, Home\_P, Start\_Date ,(Skill\_Num, Skill\_Desc) ))

2V. 1NF:

TEAMEMP( **Team \_Num**, **Skill\_Num**, **Emp\_ID**, Team \_Desc, Position**,**  Home\_P, Start\_Date ,Skill\_Desc )

2V. 2NF:

TEAMEMP[ **Team \_Num**, **Skill\_Num(FK)**, **Emp\_ID (FK)** ]

SKILL[**Skill\_Num**, Skil\_Desc]

EMPLOYEE[**Emp\_ID**, Team \_Desc, Position**,**  Home\_P, Start\_Date]

2V. 3NF:

TEAM **[Team Number,** TeamDescription**]**

Employee**[EmpId(FK)**, Name, OHIP, Phone, Start Date, TeamNumber(FK), Position]

Skills**[EmpId**, Skill Description]

#### **GTA Landscaping: User View 3**

GTA Landscaping also sells products to its customers. Below is shown a sample product sales report list. This type of report is required by the Purchasing Manager to evaluate which products are selling well and which ones are not selling well. When placing new purchases to replace items already sold, the Purchasing Manager will analyse this report first. The list shows a sample of products purchased over a 3-day period.

**Product Sales Report - 3 day Sample**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **PROD. CLASS:** | **PROD. ID:** | **PRODUCT:** | **CHARGE** | **QTY:** | **INVOICE ID:** | **INVOICE DATE:** | **SALES ASSISTANT:** | **CUST. NO.:** |
| *GT* | *10* | *6 foot garden rake* | *$12.00* | *1* | *1356* | *5-Jul-18* | *144 - Paul Smith* | *56* |
| *GT* | *40* | *Flat-nosed Shovel* | *$8.00* | *1* | *1356* | *5-Jul-18* | *144 - Paul Smith* | *56* |
| *FT* | *140* | *General grade lawn fertilizer* | *$10.00* | *3* | *1356* | *5-Jul-18* | *144 - Paul Smith* | *56* |
| *SB* | *100* | *Golden cedar sapling* | *$35.00* | *5* | *1367* | *6-Jul-18* | *145 - Maria Wong* | *7* |
| *SB* | *110* | *Mulberry sapling* | *$15.00* | *2* | *1367* | *6-Jul-18* | *145 - Maria Wong* | *7* |
| *GT* | *50* | *Garden pitch-fork* | *$7.00* | *1* | *1367* | *6-Jul-18* | *145 - Maria Wong* | *7* |
| *FT* | *140* | *General grade lawn fertilizer* | *$10.00* | *2* | *1367* | *6-Jul-18* | *145 - Maria Wong* | *7* |
| *SP* | *170* | *120 foot watering hose* | *$25.00* | *3* | *1401* | *6-Jul-18* | *144 - Paul Smith* | *34* |
| *SP* | *190* | *Rotating sprinkler jet* | *$19.00* | *3* | *1401* | *6-Jul-18* | *144 - Paul Smith* | *34* |
| *GT* | *50* | *Garden pitch-fork* | *$7.00* | *1* | *1405* | *7-Jul-18* | *145 - Maria Wong* | *56* |

Unf:

Prod[ ProdClass,ProdID, ProdDesc, Charge, QTY (InvoiceID, InvoiceDate (SalesAssID, SalesName, CustNo))]

1nf: [**ProdID, InvoiceID, SalesAssID, CustNo**, ProdClass, ProdDesc, Charge, QTY, InvoiceDate, SalesName]

2nf:

Prod[**ProdID**, ProdDesc, ProdClass, Charge, QTY]

Inv[**InvoiceID**, InvoiceDate]

Sales[**SalesAssID**, SalesName]

ProdInvSales[ProdID, InvoiceID, SalesAssID]

3nf:

Cust[**CustNo**, CustName, CustAddress]

Prod[**ProdID**, ProdDesc, ProdClass, Charge, QTY]

Inv[**InvoiceID**, InvoiceDate]

Sales[**SalesAssID**, SalesName]

ProdInvSales[**ProdID(FK), InvoiceID(FK), SalesAssID(FK), CustNO(FK**)]

3V. UNF:

PRODSALE[ Prod\_ID, Cust\_NO, Inv\_ID, Prod\_Class, Prod\_Desc, Charge, Qty, Inv\_Date, Sale\_Assit]

3V. 1NF:

PRODSALE[ Prod\_ID, Cust\_NO, Inv\_ID, Prod\_Class, Prod\_Desc, Charge, Qty, Inv\_Date, Sale\_Assit]

3V. 2NF:

PRODSALE[ Prod\_ID, Cust\_NO, Inv\_ID, Qty, Sale\_Assit]

INVOICE[Inv\_ID, Inv\_Date]

PRODUCT[Prod\_ID, Prod\_Class, Prod\_Desc, Charge]

3V. 3NF:

--------------------------------------------------------------------------------------------------------------

unf:

Sales[ProdClass, **ProdID**, ProdDesc, Charge, QTY

(**InvoiceID**, InvoiceDate( SalesAssName, **SalesAssID**(**CustNo**, CustName)))]

1nf:

Sales[**ProdID, InvoiceID, CustNo, SalesAssID,** ProdClass, ProdDesc, InvoiceDate, CustNo, CustName, Charge, Qty, SalesAssName]

2nf:

Prod[ **ProdID**, ProdClass, ProdDesc]

Invoice[ **InvoiceID**, InvoiceDate]

Sales[**SalesAssID**, SalesAssName]

cust**[CustNo** , CustName,]

Something[*ProdID(FK), InvoiceID(FK), SalesAssID(FK), CustNo(FK)*, Charge, QTY]

3NF:

Prod[ **ProdID**, ProdClass, ProdDesc, *InvoiceID(FK)*]

Invoice[ **InvoiceID**, InvoiceDate]

Sales[**SalesAssID**, SalesAssName]

cust**[CustNo** , CustName]

Something[*ProdID(FK), InvoiceID(FK), SalesAssID(FK), CustNo(FK)*, Charge, QTY]

#### **GTA Landscaping: User View 4**

Below is shown a sample product listing and pricing schedule. This report is used by the Sales Staff to determine pricing to be charged for the products that we sell. The "charge" of product sold is determined by adding the markup percentage to the cost.

**Product Report**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **PRODUCT CLASS:** | **CLASSIFICATION** | **PRODUCT ID:** | **DESCRIPTION** | **COST** | **MARKUP** | **CHARGE** |
| *GT* | *Garden Tools* | *10* | *6 foot garden rake* | *$9.23* | *30%* | *$12.00* |
| *GT* | *Garden Tools* | *20* | *7 foot leaf rake* | *$7.69* | *30%* | *$10.00* |
| *GT* | *Garden Tools* | *30* | *Round mouth shovel* | *$7.69* | *30%* | *$10.00* |
| *GT* | *Garden Tools* | *40* | *Flat-nosed Shovel* | *$6.15* | *30%* | *$8.00* |
| *GT* | *Garden Tools* | *50* | *Garden pitch-fork* | *$5.38* | *30%* | *$7.00* |
| *GT* | *Garden Tools* | *60* | *8 inch hand shears* | *$11.54* | *30%* | *$15.00* |
| *GT* | *Garden Tools* | *70* | *12 inch trimming shears* | *$14.62* | *30%* | *$19.00* |
| *GT* | *Garden Tools* | *80* | *10 inch tamper* | *$10.77* | *30%* | *$14.00* |
| *SB* | *Shrubs* | *90* | *Cedar sapling* | *$20.00* | *50%* | *$30.00* |
| *SB* | *Shrubs* | *100* | *Golden cedar sapling* | *$23.33* | *50%* | *$35.00* |
| *SB* | *Shrubs* | *110* | *Mulberry sapling* | *$10.00* | *50%* | *$15.00* |
| *SB* | *Shrubs* | *120* | *Juniper sapling* | *$16.67* | *50%* | *$25.00* |
| *FT* | *Fertilizers* | *130* | *Premium lawn fertilizer* | *$12.00* | *25%* | *$15.00* |
| *FT* | *Fertilizers* | *140* | *General grade lawn fertilizer* | *$8.00* | *25%* | *$10.00* |
| *FT* | *Fertilizers* | *150* | *Premium garden fertilizer* | *$14.40* | *25%* | *$18.00* |
| *FT* | *Fertilizers* | *160* | *General grade garden fertilizer* | *$9.60* | *25%* | *$12.00* |
| *SP* | *Sprinklers* | *170* | *120 foot watering hose* | *$17.86* | *40%* | *$25.00* |
| *SP* | *Sprinklers* | *180* | *12 inch aluminum sprinkler* | *$10.71* | *40%* | *$15.00* |
| *SP* | *Sprinklers* | *190* | *Rotating sprinkler jet* | *$13.57* | *40%* | *$19.00* |

\*charge is calculated field; description is repeating group

4V. UNF:

PRODREPORT[Prod\_Class, Prod\_Class, Prod\_ID, Prod\_Desc, Cost, Markup]

4V. 1NF:

PRODREPORT[Prod\_ID, Prod\_Class, Prod\_ Class, Prod\_ Desc, Cost, Markup]

4V. 2NF:

4V. 3NF:

===============================================

UNF

PRODUCTREPORT[**Product\_ID** , Product\_Class, Classification , Prod\_Description , Cost , Markup , Charge ]

1NF

// product class and classification are keep repeating so I am dividing them into another table

To avoid redundancy and for fullfilling the 1NF condition

PRODUCTREPORT[**Product\_ID** , Prod\_Description , Cost , Markup , Charge]

PRODUCT\_CLASSIFICATION[**Product\_ID(FK)** , Product\_Class, Classification ]

2NF

// there is no partial dependency hence I have primary key of one single field

So two 2NF would be same as 1NF

PRODUCTREPORT[**Product\_ID** , Prod\_Description , Cost , Markup , Charge ]

PRODUCT\_CLASSIFICATION[**Product\_ID(FK)** , Product\_Class, Classification ]

3NF

// charge will be calculated by adding markup percentahe to cost

// so may be it has transitive dependency

// I so confused about this 3NF may be its wrong

PRODUCTREPORT[**Product\_ID** , Prod\_Description ]

PRODUCT\_CLASSIFICATION[**Product\_ID(FK)** , Product\_Class, Classification ]

PRODUCT\_CHARGE[**Product\_ID** , Cost , Markup , Charge]

=================================================================

UserView 4

// not adding charge because it will be calculated by adding markup and cost

// description is not repeating

UNF : Product\_Report[ Product\_id(pk) , description (product\_class , classification, cost , markup)]

// identify primary key in repeating fields that would be product\_class

1NF:

Product\_Report[ Product\_id(pk) , product\_class(pk) , description ,classification, cost , markup]

// remove partial dependency

2NF:

Product\_classification[product\_class(pk), classification]

product[product\_id(pk) , description , cost]

product\_Report[product\_id(pk)(fk) , product\_class(pk)(fk) , markup]

3NF:

same as 2NF

#### **GTA Landscaping: User View 5**

GTA Landscaping maintains a list of supplier information and inventory information for the products being sold. All of our products are stored and displayed in one of the aisles of our main office showroom. (Inventory is the number of products GTA Landscaping has available for sale). Below is a sample Inventory Report

**Inventory Report**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **PRODUCT ID:** | **DESCRIPTION** | **INVENTORY** | **AISLE#** | **SUPPLIER** |
| *10* | *6 foot garden rake* | *5* | *1* | *Sheffield-Gander inc.* |
| *20* | *7 foot leaf rake* | *5* | *1* | *Sheffield-Gander inc.* |
| *30* | *Round mouth shovel* | *4* | *1* | *Husky Inc.* |
| *40* | *Flat-nosed Shovel* | *2* | *1* | *Husky Inc.* |
| *50* | *Garden pitch-fork* | *6* | *1* | *Husky Inc.* |
| *60* | *8 inch hand shears* | *9* | *2* | *Sheffield-Gander inc.* |
| *70* | *12 inch trimming shears* | *10* | *2* | *Sheffield-Gander inc.* |
| *80* | *10 inch tamper* | *3* | *2* | *Husky Inc.* |
| *90* | *Cedar sapling* | *34* | *5* | *Northwood Farms inc.* |
| *100* | *Golden cedar sapling* | *23* | *5* | *Northwood Farms inc.* |
| *110* | *Mulberry sapling* | *12* | *4* | *Sherwood Nursery* |
| *120* | *Juniper sapling* | *15* | *4* | *Northwood Farms inc.* |
| *130* | *Premium lawn fertilizer* | *4* | *6* | *Sherwood Nursery* |
| *140* | *General grade lawn fertilizer* | *12* | *6* | *Sherwood Nursery* |
| *150* | *Premium garden fertilizer* | *14* | *6* | *Sherwood Nursery* |
| *160* | *General grade garden fertilizer* | *12* | *6* | *Sherwood Nursery* |
| *170* | *120 foot watering hose* | *9* | *3* | *Diemar Garden Center* |
| *180* | *12 inch aluminum sprinkler* | *5* | *3* | *Diemar Garden Center* |
| *190* | *Rotating sprinkler jet* | *4* | *3* | *Diemar Garden Center* |

\*PK is concat of … Prod\_ID & Supplier?

5V. UNF:

PRODUCT[(**product\_id**, product\_desc, product\_qty, aisle\_no), supplier]

5V. 1NF:

PRODUCTSUPPLIER[**product\_id**, **supplier\_id**, product\_desc, product\_qty, aisle\_no, supplier\_name]

5V. 2NF:

PRODUCT[**product\_id**, product\_desc, product\_qty, aisle\_no, **supplier\_id(FK)**]

SUPPLIER[**supplier\_id,** supplier\_name]

5V. 3NF:

PRODUCT[**product\_id,** product\_desc, product\_qty, aisle\_no, **supplier\_id(FK)**]

SUPPLIER[**supplier\_id,** supplier\_name]

//Boys, Idk if I did this right lol, oh well