**No erd diagram needed for assignment 26 date**

**Dependency diagram needed**

**BOOK B pg 242 BOOK A pg 236**

**Q2 BCNF,**

**Question#5**

**Solution:**

1. **Identify the functional dependencies between the attributes.**

Primary key is composed of a combination of **TID** and **PID**

**Dependencies:**

(**TID,** **PID** 🡪 CID, CName, CEmail, TDate, TTime, TTotalAmount, TTax, PDescription, PCategory, MID, MName, PListPrice, PPurchasePrice, PQuantity, TPTotal)

**Partial Dependency:**

(**TID** 🡪 CID, CName, CEmail, TDate, TTime, TTotalAmount, TTax)

(**PID** 🡪 PDescription, PCategory, MID, MName, PListPrice, PPurchasePrice, PQuantity)

**Transitive Dependency:**

(**CID** 🡪 CName, CEmail)

(**MID** 🡪 MName)

1. **Identify the reasons why this set of data is not in 3NF and indicate the normal form (if any) it is in.**

* If there occurs any transitive dependency, then table is not in 3rd Normal Form. In given table, there are two transitive dependencies so table is not in 3rd Normal Form.
* If there occurs any partial dependency, then table is not in 2nd Normal Form. In given table, there are two transitive dependencies so table is not in 2nd Normal Form.
* If there occurs any multivalued attributed then table is not in 1st Normal Form. In given

table, there is no multivalued attribute so **table is in 1st Normal Form**.

1. **Including all intermediate stages, organize the attributes into a set of 3NF relations.**

**Conversion to Second Normal Form:**

**Step 1:  Make New Tables to Eliminate Partial Dependencies**

**Question#4**

**Solution:**

1. **Identify the functional dependencies between the attributes.**

Primary key is composed of a combination of **TID** and **PID**

**Dependencies:**

(**TID,** **PID** 🡪 CID, CName, CEmail, TDate, TTime, TTotalAmount, TTax, PDescription, PCategory, MID, MName, PListPrice, PPurchasePrice, PQuantity, TPTotal)

**Partial Dependency:**

(**TID** 🡪 CID, CName, CEmail, TDate, TTime, TTotalAmount, TTax)

(**PID** 🡪 PDescription, PCategory, MID, MName, PListPrice, PPurchasePrice, PQuantity)

**Transitive Dependency:**

(**CID** 🡪 CName, CEmail)

(**MID** 🡪 MName)

1. **Identify the reasons why this set of data is not in 3NF and indicate the normal form (if any) it is in.**

* If there occurs any transitive dependency, then table is not in 3rd Normal Form. In given table, there are two transitive dependencies so table is not in 3rd Normal Form.
* If there occurs any partial dependency, then table is not in 2nd Normal Form. In given table, there are two transitive dependencies so table is not in 2nd Normal Form.
* If there occurs any multivalued attributed then table is not in 1st Normal Form. In given

table, there is no multivalued attribute so **table is in 1st Normal Form**.

1. **Including all intermediate stages, organize the attributes into a set of 3NF relations.**

**Conversion to Second Normal Form:**

**Step 1:  Make New Tables to Eliminate Partial Dependencies**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| TID | TDate | TTime | TTotalAmount | TTax | CID | CName | CEmail |
| 823434434582 | 9/2/2015 | 10.28.34 | 167.23 | 10.37 | 2434254 | Silver Patrick | psilver@mail. net |

Table Name: TRANSACTION

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| PID | PDescription | PCategory | PListPrice | PPurchasePrice | PQuantity | MID | MName |
| 78234 | “Achieving One’s Fullest Potential” | self-help | 29.95 | 24.75 | 1 | 145432 | Brown and Gray |
| 4782349 | “Programming Server-side Solutions with Python” | Programming | 47.95 | 39.99 | 2 | 63453632 | Green & Yellow |
| 2342343 | “Murder at Eleven” | fiction | 14.95 | 12.50 | 5 | 145432 | Brown and Gray |

Table Name: PRODUCT

|  |  |  |
| --- | --- | --- |
| TID | PID | TPTotal |
| 823434434582 | **78234** | **24.75** |
| 823434434582 | **4782349** | **79.98** |
| 823434434582 | **2342343** | **62.50** |

Table Name: ASSIGNMENT

**Step 2: Reassign Corresponding Dependent Attributes**

TRANSACTION (**TID**, TDate, TTime, TTotalAmount, TTax, CID, CName, CEmail)

PRODUCT (**PID**, PDescription, PCategory, PListPrice, PPurchasePrice, PQuantity, MID, MName)

ASSIGNMENT (**TID**, **PID**, TPTotal)

**Conversion to Third Normal Form:**

**Step 1:  Make New Tables to Eliminate Transitive Dependencies**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| TID | TDate | TTime | TTotalAmount | TTax | CID |
| 823434434582 | 9/2/2015 | 10.28.34 | 167.23 | 10.37 | 2434254 |

Table Name: TRANSACTION

|  |  |  |
| --- | --- | --- |
| CID | CName | CEmail |
| 2434254 | Silver Patrick | psilver@mail. net |

Table Name: CUSTOMER

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| PID | PDescription | PCategory | PListPrice | PPurchasePrice | PQuantity | MID |
| 78234 | “Achieving One’s Fullest Potential” | self-help | 29.95 | 24.75 | 1 | 145432 |
| 4782349 | “Programming Server-side Solutions with Python” | Programming | 47.95 | 39.99 | 2 | 63453632 |
| 2342343 | “Murder at Eleven” | fiction | 14.95 | 12.50 | 5 | 145432 |

Table Name: PRODUCT

|  |  |
| --- | --- |
| MID | MName |
| 145432 | Brown and Gray |
| 63453632 | Green & Yellow |

Table Name: MANUFACTURE

|  |  |  |
| --- | --- | --- |
| TID | PID | TPTotal |
| 823434434582 | **78234** | **24.75** |
| 823434434582 | **4782349** | **79.98** |
| 823434434582 | **2342343** | **62.50** |

Table Name: ASSIGNMENT

**Step 2: Reassign Corresponding Dependent Attributes**

TRANSACTION (**TID**, TDate, TTime, TTotalAmount, TTax, CID)

CUSTOMER (CID, CName, CEmail)

PRODUCT (**PID**, PDescription, PCategory, PListPrice, PPurchasePrice, PQuantity, MID)

MANUFACTURE (MID, MName)

ASSIGNMENT (**TID**, **PID**, TPTotal)

**Question#1**

**Normalize up to 3rd Normal Form**

**Solution:**

**Conversion to First Normal Form:**

**Step 1: Eliminate the Repeating Groups**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| OID | ODATE | CID | CNAME | CSTATE | PID | PDESC | PPRICE | QTY |
| 1006 | 40110 | 2 | APEX | NC | 7 | TABLE | 800 | 1 |
| 1006 | 40110 | 2 | APEX | NC | 5 | DESK | 325 | 1 |
| 1006 | 40110 | 2 | APEX | NC | 4 | CHAIR | 200 | 5 |
| 1007 | 40111 | 6 | ACME | GA | 11 | DRESSER | 500 | 4 |
| 1007 | 40111 | 6 | ACME | GA | 4 | CHAIR | 200 | 6 |

**Step 2: Identify the Primary Key**

Primary key is composed of a combination of **OID** and **PID.**

**Step 3: Identify All Dependencies**

**(OID**, **PID** 🡪 ODATE, CID, CNAME, CSTATE, PDESC, PPRICE, QTY)

**Partial Dependencies:**

(**OID** 🡪 ODATE, CID, CNAME, CSTATE)

(**PID** 🡪 PDESC, PPRICE)

**Transitive Dependency:**

(**CID** 🡪 CNAME, CSTATE)

**Conversion to Second Normal Form:**

**Step 1:  Make New Tables to Eliminate Partial Dependencies**

|  |  |  |
| --- | --- | --- |
| PID | PDESC | PPRICE |
| 4 | CHAIR | 200 |
| 5 | DESK | 325 |
| 7 | TABLE | 800 |
| 11 | DRESSER | 500 |

Table Name: PRODUCT

|  |  |  |
| --- | --- | --- |
| OID | PID | QTY |
| 1006 | 7 | 1 |
| 1006 | 5 | 1 |
| 1006 | 4 | 5 |
| 1007 | 11 | 4 |
| 1007 | 4 | 6 |

Table Name: ASSIGNMENT

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| OID | ODATE | CID | CNAME | CSTATE |
| 1006 | 40110 | 2 | APEX | NC |
| 1007 | 40111 | 6 | ACME | GA |

Table Name: ORDER

**Step 2: Reassign Corresponding Dependent Attributes**

PRODUCT (**PID**, PDESC, PPRICE)

ASSIGNMENT (**OID**, **PID**, QTY)

ORDER (**OID**, ODATE, CID, CNAME, CSTATE)

**Conversion to Third Normal Form:**

**Step 1: Make New Tables to Eliminate Transitive Dependencies**

|  |  |  |
| --- | --- | --- |
| CID | CNAME | CSTATE |
| 2 | APEX | NC |
| 6 | ACME | GA |

Table Name: CUSTOMER

|  |  |  |
| --- | --- | --- |
| PID | PDESC | PPRICE |
| 4 | CHAIR | 200 |
| 5 | DESK | 325 |
| 7 | TABLE | 800 |
| 11 | DRESSER | 500 |

Table Name: PRODUCT

|  |  |  |
| --- | --- | --- |
| OID | ODATE | CID |
| 1006 | 40110 | 2 |
| 1007 | 40111 | 6 |

Table Name: ORDER

|  |  |  |
| --- | --- | --- |
| OID | PID | QTY |
| 1006 | 7 | 1 |
| 1006 | 5 | 1 |
| 1006 | 4 | 5 |
| 1007 | 11 | 4 |
| 1007 | 4 | 6 |

Table Name: ASSIGNMENT

**Step 2: Reassign Corresponding Dependent Attributes**

CUSTOMER (CID, CNAME, CSTATE)

PRODUCT (**PID**, PDESC, PPRICE)

ORDER (**OID**, ODATE, CID)

ASSIGNMENT (**OID**, **PID**, QTY

**Question#2**

**Normalize up to Boyce-Codd Normal Form**

**Solution:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| VisitNo | VisitDate | PatNo | PatAge | PatCity | ProvNo | ProvSpeciality | Diagnosis |
| V10020 | 1/13/2007 | P1 | 35 | DENVER | D1 | INTERNIST | EAR INFECTION |
| V10020 | 1/13/2007 | P1 | 35 | DENVER | D2 | NURSE PRACTIONER | INFLUENZZ |
| V93030 | 1/20/2007 | P3 | 17 | ENGLEWOOD | D2 | NURSE PRACTIONER | PREGNANCY |
| V82110 | 1/18/2007 | P2 | 60 | BOULDER | D3 | CARDIOLOGIST | MURMUR |

**Primary Key:**

Primary key is composed of a combination of **VisitNo** and **ProvNo**.

**All Dependencies**

**(VisitNo**, **ProvNo** 🡪 VisitDate, PatNo, PatAge, PatCity, ProvSpeciality, Diagnosis)

**Partial Dependencies:**

(**VisitNo** 🡪 VisitDate, PatNo, PatAge, PatCity)

(**ProvNo** 🡪 ProvSpeciality)

**Transitive Dependency:**

(**PatNo** 🡪 PatAge, PatCity)

**Conversion to Second Normal Form:**

**Step 1:  Make New Tables to Eliminate Partial Dependencies**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| VisitNo | VisitDate | PatNo | PatAge | PatCity |
| V10020 | 1/13/2007 | P1 | 35 | DENVER |
| V82110 | 1/18/2007 | P2 | 60 | BOULDER |
| V93093 | 1/20/2007 | P3 | 17 | ENGLEWOOD |

Table Name: VISIT

|  |  |
| --- | --- |
| ProvNo | ProvSpeciality |
| D1 | INTERNIST |
| D2 | NURSE PRACTIONER |
| D3 | CARDIOLOGIST |

Table Name: PROVIDER

|  |  |  |
| --- | --- | --- |
| VisitNo | ProvNo | Diagnosis |
| V10020 | D1 | EAR INFECTION |
| V10020 | D2 | INFLUENZZ |
| V93093 | D2 | PREGNANCY |
| V82110 | D3 | MURMUR |

Table Name: ASSIGNMENT

**Step 2: Reassign Corresponding Dependent Attributes**

VISIT (**VisitNo**, VisitDate, PatNo, PatAge, PatCity)

PROVIDER (**ProvNo**, ProvSpeciality)

ASSIGNMENT (**VisitNo**, **ProvNo**, Diagnosis)

**Conversion to Third Normal Form:**

**Step 1:  Make New Tables to Eliminate Transitive Dependencies**

|  |  |  |
| --- | --- | --- |
| PatNo | PatAge | PatCity |
| P1 | 35 | DENVER |
| P2 | 60 | BOULDER |
| P3 | 17 | ENGLEWOOD |

Table Name: PATIENT

|  |  |
| --- | --- |
| ProvNo | ProvSpeciality |
| D1 | INTERNIST |
| D2 | NURSE PRACTIONER |
| D3 | CARDIOLOGIST |

Table Name: PROVIDER

|  |  |  |
| --- | --- | --- |
| VisitNo | VisitDate | PatNo |
| V10020 | 1/13/2007 | P1 |
| V82110 | 1/18/2007 | P2 |
| V93093 | 1/20/2007 | P3 |

Table Name: VISIT

|  |  |  |
| --- | --- | --- |
| VisitNo | ProvNo | Diagnosis |
| V10020 | D1 | EAR INFECTION |
| V10020 | D2 | INFLUENZZ |
| V93093 | D2 | PREGNANCY |
| V82110 | D3 | MURMUR |

Table Name: ASSIGNMENT

**Step 2: Reassign Corresponding Dependent Attributes**

PATIENT (PatNo, PatAge, PatCity)

PROVIDER (**ProvNo**, ProvSpeciality)

VISIT (**VisitNo**, VisitDate, PatNo)

ASSIGNMENT (**VisitNo**, **ProvNo**, Diagnosis)

**Question#7**

**Consider the relation R (V, W, X, Y, Z) with functional dependencies**

**F = {Z 🡪 Y, Y 🡪 Z, X 🡪 Y, X 🡪 V, VW 🡪 X}.**

1. **Find the X-closure of all the attributes V, W, X, Y and Z**

W+ = W

V+ = V

X+ = VXYZ

Y+ = YZ

Z+ = YZ

1. **Find all candidate keys.**

VW+ = VWXYZ

XW+ = VWXYZ

Candidate Key = {VW, XW}

**Question#8**

**You are given the below functional dependencies for relation R (A, B, C, D, E)**

**F = {AB🡪 C, AB 🡪 D, D 🡪 A, BC 🡪 D, BC 🡪 E}.**

1. **Find all candidate keys.**

B+ = B

AB+ = ABCDE

CB+ = ABCDE

DB+ = ABCDE

EB+ = BE

Candidate Key = {AB, CB, DB}

1. **Identify the best normal form that R satisfies (1NF, 2NF, 3NF, or BCNF).**

3NF

1. **Is this relation in BCNF? If not, show all dependencies that violate it.**

No, it’s not in BCNF.

F = {D 🡪 A}

1. **Is this relation in 3NF? If not, show all dependencies that violate it.**

Yes, it’s in 3NF.

**Question#9**

**You are given the below set of functional dependencies for a relation R (A, B, C, D, E, F, G)**

**F = {AD** 🡪 **BF, CD** 🡪 **EGC, BD** 🡪 **F, E** 🡪 **D, F** 🡪 **C, D** 🡪 **F}.**

1. **Find all candidate keys.**

Candidate Key = { AD }

1. **Find F-closure.**

A🡪A, B 🡪B, C🡪C,D🡪D, E🡪E , F🡪F, G🡪G Using Reflexive Property

AD 🡪B , AD 🡪 F using decomposition

**CD** 🡪E, **CD** 🡪G , **CD** 🡪C

D🡪 C using transitivity { D 🡪 F, F 🡪 C }

BG 🡪 C using transitivity { BG 🡪 F, F 🡪 C }

D 🡪CDF using D 🡪 C, D 🡪 F

E 🡪 CDEF Using F = {E🡪D, D 🡪 CDF }

F 🡪 CF Using F = {F 🡪 C}

AD 🡪 ABCDEFG using D 🡪 CDEFG, AD🡪BF, A🡪A (Candidate Key)

CD 🡪 CDEFG Using Reflexive Property, F = {CD🡪EGC}

1. **Find the minimal cover for the above set of functional dependencies**

F = {AD🡪BF, D🡪E, D🡪F, D🡪G, E🡪D, F🡪C}