**ITM 531 OBJECT ORIENTED MODELING, DESIGN & ANALYSIS**

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**Module One Assignment**

**1. VIEW INTEGRATION: From the following views,**

**1.1 Generate a 3NF/BCNF database using the relational view integration algorithm. Include the minimal cover FD set and identify any missing keys. 1.2 Show how the relations in your design from step 1.1 are to be used to retrieve each view.**

V1 ( EMP#, PROJ, TASK, %TIME, ACCT ) KEY: EMP#, PROJ

V2 ( EMP#, PROJ, P-LEADER, E-PHONE# ) KEY: EMP#, PROJ

V3 ( DEPT, PROJ, D-MGR, V-PRES, DIV ) KEY: DEPT, PROJ

V4 ( DEPT, PROJ, P-LEADER, V-PRES, ACCT ) KEY: DEPT, PROJ

V5 ( EMP#, DEPT, D-MGR, DIV) KEY: EMP#

V6 ( EMP#, ENAME, TITLE, OFF#, PHONE# ) KEY: EMP#

V7 ( DEPT, D-MGR, DIV ) KEY: DEPT

V8 ( EMP#, PROJ, PAY-PERIOD, HOURS-WORKD ) KEY: EMP#, PROJ, PAY-PERIOD

V9 ( PART, PART-DESCR ) KEY: PART

V10 ( DIV, V-PRES, DIV-SITE, BUDGET-CODE ) KEY: DIV

V11 ( PROJ, PAY-PERIOD, TOTAL-HOURS, PAY) KEY: PROJ, PAY- PERIOD

V12 ( PROJ, DIV, P-LEADER, BDGT# ) KEY: PROJ

V13 ( PROJ, CUSTOMER, V-PRES ) KEY: PROJ

V14 ( DEPT, PROJ, ACCT#, HOURS-CHARGED) KEY: DEPT, PROJ

V15 ( INV-REQ#, PROJ, P-LEADER ) KEY#: INV-REQ#, PROJ

V16 ( WHSE-SITE, W-ADDR, W-PHONE# ) KEY: WHSE-SITE

V17 ( WHSE-SITE, DIV, V-PRES ) KEY: WHSE-SITE

V18 ( WHSE-SITE, AISLE, SHELF, PART#, QNTY) KEY: WHSE-SITE, AISLE, SHELF

V19 ( INV-REQ#, PART, QNTY, WHSE-SITE) KEY: INV-REQ#, PART

V20 ( INV-REQ#, P-LEADER, WHSE-SITE, COST) KEY: INV-REQ#

V21 ( INV-REQ#, PROJ, EMP#) KEY: INV-REQ#

V22 ( PO#, SUPPLIER, S-PHONE# ) KEY: PO#

V23 ( PO#, EMP#, PHONE#, P-LEADER ) KEY: PO#

V24 ( PO#, PART, PO-QNTY, SUPPLIER, DEPT ) KEY: PO#, PART

V25 ( PO#, DEPT, DIV, PO-COST ) KEY: PO#

V26 (PO#, PROJ, PART, P-LEADER, PROJ-ALLOC) KEY: PO#, PROJ, PART

V27 ( PROJ, PART, QUANTITY-REQ ) KEY: PROJ, PART

V28 ( PROJ, TASK, STATUS, COST, P-LEADER ) KEY: DIV,CUSTOMER

V29 ( TASK, TASK-DESCR, DEPT, D-MGR ) KEY: TASK

V30 ( SUPPLIER, PROJ, SUP-BILLING, S-PHONE#) KEY: SUPPLIER, PROJ

V31 ( PROJ, DIV, P-LEADER ) KEY: PROJ

V32 ( INV-REQ#, DEPT, D-MGR, P-LEADER ) KEY: INV-REQ#

V33 ( SUPPLIER, S-PHONE#, S-ADDR ) KEY: SUPPLIER

V34 ( WHSE-SITE, PART, PART-DESCR) KEY: WHSE-SITE, PART

V35 ( INV-REQ#, WHSE-EMP#, VEHICLE-ID ) KEY: INV-REQ#

V36 ( PROJ-CONTRACT#, CUSTOMER, CUST# ) KEY: PROJ- CONTRACT#

V37 ( PROJ-CONTRACT#, PROJ, P-LEADER ) KEY: PROJ- CONTRACT#

V38 (CUST#, CUSTOMER, P-LEADER, V-PRES ) KEY: CUST#, PROJ

V39 ( PART, WHSE-SITE, IN-STOCK ) KEY: PART, WHSE- SITE

V40 ( PROJ, PROJ-COSTS, EXPECTED REVENUE) KEY: PROJ

Step 1:Creating FDs for the given views

EMP#, PROJ 🡪 TASK

EMP#, PROJ 🡪 %TIME

EMP#, PROJ 🡪 ACCT

EMP#, PROJ 🡪 P-LEADER

EMP#, PROJ 🡪 E-PHONE#

DEPT,PROJ 🡪D-MGR

DEPT,PROJ 🡪V-PRES

DEPT,PROJ 🡪DIV

DEPT,PROJ🡪P-LEADER

DEPT,PROJ🡪V-PRES

DEPT,PROJ🡪ACCT

EMP# 🡪 DEPT

EMP🡪D-MGR

EMP🡪DIV

EMP🡪ENAME

EMP🡪TITLE

EMP🡪OFF#

EMP🡪PHONE#

DEPT🡪D-MGR

DEPT🡪DIV

EMP#, PROJ, PAY-PERIOD 🡪HOURS-WORKD

PART🡪 PART-DESCR

DIV🡪V-PRES

DIV🡪DIV-SITE

DIV🡪BUDGET-CODE

PROJ,PAY-PERIOD🡪TOTAL-HOURS

PROJ,PAY-PERIOD🡪PAY

PROJ🡪DIV

PROJ🡪P-LEADER

PROJ🡪BDGT#

PROJ🡪CUSTOMER

PROJ🡪V-PRES

DEPT, PROJ 🡪 ACCT#

DEPT,PROJ🡪HOURS-CHARGED

INV-REQ#, PROJ 🡪 P-LEADER

WHSE-SITE 🡪 W-ADDR

WHSE-SITE🡪W-PHONE#

WHSE-SITE 🡪 DIV

WHSE-SITE🡪 V-PRES

WHSE-SITE, AISLE, SHELF 🡪 PART#

WHSE-SITE,AISLE,SHELF🡪QNTY

INV-REQ#, PART 🡪 QNTY

INV-REQ#, PART 🡪WHSE-SITE

INV-REQ# 🡪 P-LEADER

INV-REQ# 🡪 WHSE-SITE

INV-REQ# 🡪 COST

INV-REQ# 🡪 PROJ

INV-REQ# --->EMP#

PO# 🡪 SUPPLIER,

PO🡪S-PHONE#

PO# 🡪 EMP#

PO# 🡪 PHONE#

PO# 🡪 P-LEADER

PO#, PART 🡪 PO-QNTY

PO#, PART 🡪 SUPPLIER

PO#, PART 🡪 DEPT

PO#🡪 DEPT

PO#🡪 DIV

PO#🡪PO-COST

PO#, PROJ, PART 🡪 P-LEADER

PO#, PROJ, PART 🡪 PROJ-ALLOC

PROJ, PART 🡪 QUANTITY-REQ

PROJ, TASK 🡪 STATUS

PROJ, TASK 🡪 COST

PROJ, TASK 🡪 P-LEADER

TASK 🡪 TASK-DESCR

TASK 🡪 DEPT

TASK 🡪 D-MGR

SUPPLIER, PROJ 🡪 SUP-BILLING

SUPPLIER, PROJ 🡪 S-PHONE#

PROJ🡪DIV

PROJ🡪P-LEADER

INV-REQ# 🡪 DEPT

INV-REQ# 🡪 D-MGR

INV-REQ# 🡪 P-LEADER

SUPPLIER🡪 S-PHONE#

SUPPLIER🡪 S-ADDR

WHSE-SITE, PART 🡪 PART-DESCR

INV-REQ# 🡪 WHSE-EMP#

INV-REQ# 🡪 VEHICLE-ID

PROJ-CONTRACT# 🡪 CUSTOMER

PROJ-CONTRACT# 🡪 CUST#

PROJ-CONTRACT# 🡪 PROJ

PROJ-CONTRACT# 🡪 P-LEADER

CUST# 🡪 CUSTOMER

CUST# 🡪 P-LEADER

CUST# 🡪 V-PRES

PART, WHSE-SITE🡪IN-STOCK

PROJ 🡪 PROJ-COSTS

PROJ 🡪 EXPECTED REVENUE

Step2:Minimization of FDs

EMP#, PROJ 🡪 TASK

EMP#, PROJ 🡪 %TIME

~~EMP#, PROJ 🡪 ACCT~~

~~EMP#, PROJ 🡪 P-LEADER~~

EMP#, PROJ 🡪 E-PHONE#

~~DEPT,PROJ 🡪D-MGR~~

~~DEPT,PROJ 🡪V-PRES~~

~~DEPT,PROJ 🡪DIV~~

~~DEPT,PROJ🡪P-LEADER~~

~~DEPT,PROJ🡪V-PRES~~

DEPT,PROJ🡪ACCT

EMP# 🡪 DEPT

~~EMP🡪D-MGR~~

EMP🡪DIV

EMP🡪ENAME

EMP🡪TITLE

EMP🡪OFF#

EMP🡪PHONE#

DEPT🡪D-MGR

~~DEPT🡪DIV~~

EMP#, PROJ, PAY-PERIOD 🡪HOURS-WORKD

PART🡪 PART-DESCR

DIV🡪V-PRES

DIV🡪DIV-SITE

DIV🡪BUDGET-CODE

PROJ,PAY-PERIOD🡪TOTAL-HOURS

PROJ,PAY-PERIOD🡪PAY

~~PROJ🡪DIV~~

~~PROJ🡪P-LEADER~~

PROJ🡪BDGT#

~~PROJ🡪CUSTOMER~~

~~PROJ🡪V-PRES~~

~~DEPT, PROJ 🡪 ACCT#~~

DEPT,PROJ🡪HOURS-CHARGED

~~INV-REQ#, PROJ 🡪 P-LEADER~~

WHSE-SITE 🡪 W-ADDR

WHSE-SITE🡪W-PHONE#

~~WHSE-SITE 🡪 DIV~~

~~WHSE-SITE🡪 V-PRES~~

WHSE-SITE, AISLE, SHELF 🡪 PART#

~~WHSE-SITE,AISLE,SHELF🡪QNTY~~

INV-REQ#, PART 🡪 QNTY

~~INV-REQ#, PART 🡪WHSE-SITE~~

~~INV-REQ# 🡪 P-LEADER~~

INV-REQ# 🡪 WHSE-SITE

INV-REQ# 🡪 COST

~~INV-REQ# 🡪 PROJ~~

INV-REQ# --->EMP#

PO# 🡪 SUPPLIER,

PO🡪S-PHONE#

~~PO# 🡪 EMP#~~

~~PO# 🡪 PHONE#~~

~~PO# 🡪 P-LEADER~~

PO#, PART 🡪 PO-QNTY

~~PO#, PART 🡪 SUPPLIER~~

~~PO#, PART 🡪 DEPT~~

~~PO#🡪 DEPT~~

~~PO#🡪 DIV~~

PO#🡪PO-COST

~~PO#, PROJ, PART 🡪 P-LEADER~~

PO#, PROJ, PART 🡪 PROJ-ALLOC

PROJ, PART 🡪 QUANTITY-REQ

PROJ, TASK 🡪 STATUS

~~PROJ, TASK 🡪 COST~~

~~PROJ, TASK 🡪 P-LEADER~~

TASK 🡪 TASK-DESCR

~~TASK 🡪 DEPT~~

~~TASK 🡪 D-MGR~~

SUPPLIER, PROJ 🡪 SUP-BILLING

~~SUPPLIER, PROJ 🡪 S-PHONE#~~

~~PROJ🡪DIV~~

PROJ🡪P-LEADER

~~INV-REQ# 🡪 DEPT~~

~~INV-REQ# 🡪 D-MGR~~

~~INV-REQ# 🡪 P-LEADER~~

~~SUPPLIER🡪 S-PHONE#~~

SUPPLIER🡪 S-ADDR

~~WHSE-SITE, PART 🡪 PART-DESCR~~

INV-REQ# 🡪 WHSE-EMP#

INV-REQ# 🡪 VEHICLE-ID

~~PROJ-CONTRACT# 🡪 CUSTOMER~~

PROJ-CONTRACT# 🡪 CUST#

PROJ-CONTRACT# 🡪 PROJ

~~PROJ-CONTRACT# 🡪 P-LEADER~~

CUST# 🡪 CUSTOMER

CUST# 🡪 P-LEADER

~~CUST# 🡪 V-PRES~~

PART, WHSE-SITE🡪IN-STOCK

PROJ 🡪 PROJ-COSTS

PROJ 🡪 EXPECTED REVENUE

FDs after minimization:

EMP#, PROJ 🡪 TASK

EMP#, PROJ 🡪 %TIME

EMP#, PROJ 🡪 E-PHONE#

DEPT,PROJ🡪ACCT

EMP# 🡪 DEPT

EMP🡪DIV

EMP🡪ENAME

EMP🡪TITLE

EMP🡪OFF#

EMP🡪PHONE#

DEPT🡪D-MGR

EMP#, PROJ, PAY-PERIOD 🡪HOURS-WORKD

PART🡪 PART-DESCR

DIV🡪V-PRES

DIV🡪DIV-SITE

DIV🡪BUDGET-CODE

PROJ,PAY-PERIOD🡪TOTAL-HOURS

PROJ,PAY-PERIOD🡪PAY

PROJ🡪BDGT#

DEPT,PROJ🡪HOURS-CHARGED

WHSE-SITE 🡪 W-ADDR

WHSE-SITE🡪W-PHONE#

WHSE-SITE, AISLE, SHELF 🡪 PART#

INV-REQ#, PART 🡪 QNTY

INV-REQ# 🡪 WHSE-SITE

INV-REQ# 🡪 COST

INV-REQ# --->EMP#

PO# 🡪 SUPPLIER,

PO🡪S-PHONE#

PO#, PART 🡪 PO-QNTY

PO#🡪PO-COST

PO#, PROJ, PART 🡪 PROJ-ALLOC

PROJ, PART 🡪 QUANTITY-REQ

PROJ, TASK 🡪 STATUS

TASK 🡪 TASK-DESCR

SUPPLIER, PROJ 🡪 SUP-BILLING

PROJ🡪P-LEADER

SUPPLIER🡪 S-ADDR

INV-REQ# 🡪 WHSE-EMP#

INV-REQ# 🡪 VEHICLE-ID

PROJ-CONTRACT# 🡪 CUST#

PROJ-CONTRACT# 🡪 PROJ

CUST# 🡪 CUSTOMER

CUST# 🡪 P-LEADER

PART, WHSE-SITE🡪IN-STOCK

PROJ 🡪 PROJ-COSTS

PROJ 🡪 EXPECTED REVENUE

Step3: Grouping the minimized FDs

EMP#, PROJ 🡪 TASK,%TIME,E-PHONE#

DEPT,PROJ🡪ACCT

EMP# 🡪 DEPT

EMP🡪ENAME,DIV,TITLE,OFF#,PHONE#

DEPT🡪D-MGR

EMP#, PROJ, PAY-PERIOD 🡪HOURS-WORKD

PART🡪 PART-DESCR

DIV🡪V-PRES,DIV-SITE,BUDGET-CODE

PROJ,PAY-PERIOD🡪TOTAL-HOURS,PAY

PROJ🡪BDGT#,P-LEADER, PROJ-COSTS, EXPECTED REVENUE

DEPT,PROJ🡪HOURS-CHARGED

WHSE-SITE 🡪 W-ADDR,W-PHONE#

WHSE-SITE, AISLE, SHELF 🡪 PART#

INV-REQ#, PART 🡪 QNTY

INV-REQ# 🡪 WHSE-SITE,COST,EMP#

PO# 🡪 SUPPLIER, PO-COST

PO🡪S-PHONE#

PO#, PART 🡪 PO-QNTY

PO#, PROJ, PART 🡪 PROJ-ALLOC

PROJ, PART 🡪 QUANTITY-REQ

PROJ, TASK 🡪 STATUS

TASK 🡪 TASK-DESCR

SUPPLIER, PROJ 🡪 SUP-BILLING

SUPPLIER🡪 S-ADDR

INV-REQ# 🡪 WHSE-EMP# ,VEHICLE-ID

PROJ-CONTRACT# 🡪 CUST#,PROJ

CUST# 🡪 CUSTOMER,P-LEADER

PART, WHSE-SITE🡪IN-STOCK

Step4: Relations built from the grouped FDs

R1(EMP#, PROJ 🡪 TASK,%TIME,E-PHONE#)

R2(DEPT,PROJ🡪ACCT,HOURS\_CHARGED)

R3(EMP# 🡪 DEPT)

R4(EMP🡪ENAME,TITLE,OFF#,PHONE#)

R5(DEPT🡪D-MGR)

R6(EMP#, PROJ, PAY-PERIOD 🡪HOURS-WORKD)

R7(PART🡪 PART-DESCR)

R8(DIV🡪DIV-SITE,BUDGET-CODE)

R9(PROJ,PAY-PERIOD🡪TOTAL-HOURS,PAY)

R10(PROJ🡪BDGT#,P-LEADER, PROJ-COSTS, EXPECTED REVENUE,DIV,V-PRES)

R12(WHSE-SITE 🡪 W-ADDR,W-PHONE#)

R13(WHSE-SITE, AISLE, SHELF 🡪 PART#)

R14(INV-REQ#, PART 🡪 QNTY)

R15(INV-REQ# 🡪 WHSE-SITE,COST,EMP#)

R16(PO# 🡪 SUPPLIER, PO-COST)

R17(PO#🡪S-PHONE# )

R18(PO#, PART 🡪 PO-QNTY)

R19(PO#, PROJ, PART 🡪 PROJ-ALLOC)

R20(PROJ, PART 🡪 QUANTITY-REQ )

R21(PROJ, TASK 🡪 STATUS )

R22(TASK 🡪 TASK-DESCR)

R23(SUPPLIER, PROJ 🡪 SUP-BILLING)

R24(SUPPLIER🡪 S-ADDR)

R25(INV-REQ# 🡪 WHSE-EMP# ,VEHICLE-ID)

R26(PROJ-CONTRACT# 🡪 CUST#,PROJ)

R27(CUST# 🡪 CUSTOMER,P-LEADER)

R28(PART, WHSE-SITE🡪IN-STOCK)

Step5: views retrieval from built relations in step4:

|  |  |
| --- | --- |
| Given Views | Views Retrieval from Relations |
| V1 ( EMP#, PROJ, TASK, %TIME, ACCT ) | R1 JOIN R2 ON PROJ-->EMP#,PROJ,TASK,%TIME,ACCT |
| V2 ( EMP#, PROJ, P-LEADER, E-PHONE# ) | R1 JOIN R10 ON PROJ-->EMP#,PROJ,P-LEADER,E-PHONE# |
| V3 ( DEPT, PROJ, D-MGR, V-PRES, DIV ) | R2 JOIN R5 ON DEPT-->DEPT,PROJ,D-MGR R2 JOIN R10 ON PROJ-->DIV,V-PRES |
| V4 ( DEPT, PROJ, P-LEADER, V-PRES, ACCT ) | R2 JOIN R10 ON PROJ-->DEPT,PROJ,P-LEADER,ACCT,V-PRES |
| V5 ( EMP#, DEPT, D-MGR, DIV) | R1 JOIN R3 ON DEPT-->EMP#,DEPT R3 JOIN R5 ON DEPT-->D-MGR R1 JOIN R10 ON PROJ-->DIV |
| V6 ( EMP#, ENAME, TITLE, OFF#, PHONE# ) | R4 |
| V7 ( DEPT, D-MGR, DIV ) | R2 JOIN R5 ON DEPT-->DEPT,D-MGR R2 JO R10 ON PROJ-->DIV |
| V8 ( EMP#, PROJ, PAY-PERIOD, HOURS-WORKD ) | R6 |
| V9 ( PART, PART-DESCR ) | R7 |
| V10 ( DIV, V-PRES, DIV-SITE, BUDGET-CODE ) | R9 JOIN R10 ON PROJ-->DIV,V-PRES R8 JOIN R10 ON DIV-->DIV-SITE,BUDGET-CODE |
| V11 ( PROJ, PAY-PERIOD, TOTAL-HOURS, PAY) | R9 |
| V12 ( PROJ, DIV, P-LEADER, BDGT# ) | R10-PROJ,DIV,P-LEADER,BDGT# |
| V13 ( PROJ, CUSTOMER, V-PRES ) | R10 JOIN R26 ON PROJ-->PROJ,V-PRESS R26 JOIN R27 ON CUST#-->CUSTOMER |
| V14 ( DEPT, PROJ, ACCT#, HOURS-CHARGED) | R2 |
| V15 ( INV-REQ#, PROJ, P-LEADER ) | R15 JOIN R6 ON EMP#-->INV-REQ#,PROJ R6 JOIN R10 ON PROJ-->P-LEADER |
| V16 ( WHSE-SITE, W-ADDR, W-PHONE# ) | R12 |
| V17 ( WHSE-SITE, DIV, V-PRES ) | R14 JOIN R15 ON INV-REQ#-->WHSE-SITE R9 JOIN R10 ON PROJ-->DIV,V-PRES |
| V18 ( WHSE-SITE, AISLE, SHELF, PART#, QNTY) | R13-->WHSE\_SITE,AISLE,SHELF,PART R15 JOIN R14 ON INV-REQ#-->QTY |
| V19 ( INV-REQ#, PART, QNTY, WHSE-SITE) | R14 JOIN R15 ON INV-REQ#-->INV-REQ#,PART,QNTY,WHSE-SITE |
| V20 ( INV-REQ#, P-LEADER, WHSE-SITE, COST) | R15 JOIN R6 ON EMP#-->WHSE-SITE,COST,INV-REQ#,EMP#,PROJ R6 JOIN R10 ON PROJ-->P-LEADER |
| V21 ( INV-REQ#, PROJ, EMP#) | R15 JOIN R6 ON EMP#-->INV-REQ#,EMP#,PROJ |
| V22 ( PO#, SUPPLIER, S-PHONE# ) | R16 JOIN R17 ON PO#-->PO#,SUPPLIER,S-PHONE# |
| V23 ( PO#, EMP#, PHONE#, P-LEADER ) | R3 JOIN R4 ON EMP#-->EMP#,PHONE# R6 JOIN R10 ON PROJ-->P-LEADER R10 JOIN R19 ON PROJ-->PO# |
| V24 ( PO#, PART, PO-QNTY, SUPPLIER, DEPT ) | R16 JOIN R18 ON PO#-->PO#,PART,PO-QNTY,SUPPLIER R19 JOIN R2 ON PROJ-->DEPT |
| V25 ( PO#, DEPT, DIV, PO-COST ) | R19 JOIN R2 ON PROJ-->PO#,DEPT R16 JOIN R19 ON PO#-->PO-COST R19 JOIN R10 ON PROJ-->DIV |
| V26 (PO#, PROJ, PART, P-LEADER, PROJ-ALLOC) | R19 JOIN R10 ON PROJ-->PO#,PROJ,PART,P-LEADER,PROJ-ALLOC |
| V27 ( PROJ, PART, QUANTITY-REQ ) | R20 |
| V28 ( PROJ, TASK, STATUS, COST, P-LEADER ) | R21-->PROJ,TASK,STATUS R14 JOIN R15 ON INV-REQ#-->COST R14 JOIN R10 ON PROJ-->P-LEADER |
| V29 ( TASK, TASK-DESCR, DEPT, D-MGR ) | R22 JOIN R21 ON TASK-->TASK,TASK-DESCR,PROJ R2 JOIN R5 ON DEPT-->DEPT,D-MGR |
| V30 ( SUPPLIER, PROJ, SUP-BILLING, S-PHONE#) | R16 JOIN R17 ON PO#-->SUPPLIER,S-PHONE# R23 JOIN R24 ON SUPPLIER-->PROJ,SUP-BILLING |
| V31 ( PROJ, DIV, P-LEADER ) | R10 |
| V32 ( INV-REQ#, DEPT, D-MGR, P-LEADER ) | R3 JOIN R15 ON EMP#-->INV-REQ# R3 JOIN R5 ON DEPT-->DEPT,D-MGR R6 JOIN R10 ON PROJ-->P-LEADER |
| V33 ( SUPPLIER, S-PHONE#, S-ADDR ) | R16 JOIN R17 ON PO#-->SUPPLIER,S-PHONE#, R23 JOIN R24 ON SUPPLIER-->S-ADDR |
| V34 ( WHSE-SITE, PART, PART-DESCR) | R14 JOIN R15 ON INV-REQ#-->WHSE-SITE,PART R7 JOIN R14 ON PART-->PART-DESCR |
| V35 ( INV-REQ#, WHSE-EMP#, VEHICLE-ID ) | R15 JOIN R25 ON INV-REQ#-->INV-REQ#,WHSE-EMP#,VEHICLE-ID |
| V36 ( PROJ-CONTRACT#, CUSTOMER, CUST# ) | R26 JOIN R27 ON CUST#-->PROJ-CONTRACT#,CUSTOMER,CUST# |
| V37 ( PROJ-CONTRACT#, PROJ, P-LEADER ) | R26 JOIN R27 ON CUST#-->PROJ-CONTRACT#,PROJ,P-LEADER |
| V38 (CUST#, CUSTOMER, P-LEADER, V-PRES ) | R26 JOIN R27 ON CUST#-->CUST#,CUSTOMER,P-LEADER R10 JOIN R20 ON PROJ-->V-PRES |
| V39 ( PART, WHSE-SITE, IN-STOCK ) | R28 |
| V40 ( PROJ, PROJ-COSTS, EXPECTED REVENUE) | R10 |

**2. DATABASE MAINTENANCE: Using the relational database designed in question 1, determine whether or not the database supports each of the following new views one at a time. If not, what changes need to be made to the database to make it support each view. Are there any side effects to existing views because of these changes. If so, identify those changes. As in question 1, show how the database supports each of these views.**

V41 ( P-LEADER, DIV, DIV-SITE ) KEY: P-LEADER

Solution:

This view can be extracted from relations R10,R8 and R1 as given below:

R1 JOIN R10 ON PROJ GIVES P-LEADER,DIV

R8 JOIN R10 ON DIV GIVES DIV-SITE

Since this view cab be retrieved from the existing relations as explained above, no changes would be required on the existing views/relations.

V42 ( WHSE-SITE, WHSE-DIR, V-PRES ) KEY: WHSE-SITE

WHSE-DIR 🡪 V-PRES

Solution:

There is no attribute ‘WHSE-DIR in the given views/relations. Hence, we would need to add a new relation as shown below to make this view a retrievable one.

R29(WHSE-SITE, WHSE-DIR, V-PRES) This new relation addition would not affect the existing views. Hence no change would be required to the existing views.

V43 ( SUPPLIER, SUPLR-REP, S-PHONE# ) KEY; SUPPLIER

SUPLR-REP 🡪 S-PHONE#

Solution:

There is already a relation ‘R16(PO#-->SUPPLIER),R17( PO#-->S-PHONE#)’ connecting SUPPLIER and S-PHONE# through PO#,but attribute ‘SUPLR-REP’ is not present already. Since SUPPLIER is the key and SUPLR-REP → S-PHONE#, a new relation can be added as given below:

R30(SUPLR-REP, S-PHONE#) And the existing relation R16 can be modified as shown below: R16(SUPPLIER, SUPLR-REP)

Views that were retrieved with this existing relation R17 are:

V22 ( PO#, SUPPLIER, S-PHONE# )

V30 ( SUPPLIER, PROJ, SUP-BILLING, S-PHONE#)

V33 ( SUPPLIER, S-PHONE#, S-ADDR )

|  |  |  |
| --- | --- | --- |
| View | Old Retrieval | New Retrieval |
| V22 ( PO#, SUPPLIER, S-PHONE# ) | R16 JOIN R17 ON PO#-->PO#,SUPPLIER,S-PHONE# | R16 JOIN R30 ON SUPLR-REP-->PO#,SUPPLIER,S-PHONE# |
| V30 ( SUPPLIER, PROJ, SUP-BILLING, S-PHONE#) | R16 JOIN R17 ON PO#-->SUPPLIER,S-PHONE# R23 JOIN R24 ON SUPPLIER-->PROJ,SUP-BILLING | R16 JOIN R30 ON SUPLR-REP-->SUPPLIER,S-PHONE# R23 JOIN R24 ON SUPPLIER-->PROJ,SUP-BILLING |
| V33 ( SUPPLIER, S-PHONE#, S-ADDR ) | R16 JOIN R17 ON PO#-->SUPPLIER,S-PHONE#, R23 JOIN R24 ON SUPPLIER-->S-ADDR | R16 JOIN R30 ON SUPLR-REP-->SUPPLIER,S-PHONE#, R23 JOIN R24 ON SUPPLIER-->S-ADDR |

3. **DATABASE NAVIGATION: Using the following database, find different “navigational paths” which allow you to answer the following query: “ Identify every person who had some responsibility for consummating a sales contract on behalf of CUST# ‘61125’ in which they ordered an ITEM referred to as a ‘5 speed motor’”. For each path that you identify, provide an English language description to distinguish the path along with the data dependency used to retrieve the data.**

**CUSTOMER** ( **CUST#**, CUST-EMAIL, CUST-ADDR )

**CUST-LIAISON** ( **CUST#**, SALES-MGR, MGR-PHONE# )

*Note:* Every customer is assigned a corporate sales manager.

**SALES-CONTRACTS** ( **SALES-CONTRACT#,** CUST# )

**SALES-CONTRACT-ITEMS** ( **SALES-CONTRACT#, ITEM#,** QUANTITY )

**ITEMS ( ITEM#,** ITEM-NAME )

**WHSE- ITEMS** ( **ITEM#,** WHSE#, AISLE#, SHELF#, QNTY-IN-STOCK )

**DELIVERY-ORDER** ( **DEL-ORDER#,**  SALES-CONTRACT# )

**WHSE-DELIVERY-ITEMS** ( **DEL-ORDER#, ITEM#,** QNTY, WHSE# )

*Note*: THESE ITEMS ARE IN-STOCK IN ONE OF OUR WAREHOUSES

**WAREHOUSE ( WHSE#,** WHSE-MGR )

**SUPPLIER-DELIVERY-ITEMS** (**DEL-ORDER#, ITEM#,** QNTY, SUP-ORDER#)

*Note:* THESE ITEMS ARE OUT-OF-STOCK AND MUST BE ORDERED FROM A SUPPLIER

**SUPPLIER-ORDER ( SUP-ORDER#,** SALES-CONTRACT#, SUPPLIER# )

**SUPPLIER-ORDER-ITEMS ( SUP-ORDER#, ITEM#**, QNTY )

**SUPPLIER ( SUPPLIER#,** SUPPLIER-LIAISON )

Answer:

**1)SALES-CONTRACTS** ( **SALES-CONTRACT#,** CUST# )

This determines the customer id and joins with the sales-contract-items table on sales-contract field to check the item number and number of quantity ordered for each item.**SALES-CONTRACT-ITEMS** ( **SALES-CONTRACT#, ITEM#,** QUANTITY )

**2)WAREHOUSE ( WHSE#,** WHSE-MGR )

**WHSE- ITEMS** ( **ITEM#,** WHSE#, AISLE#, SHELF#, QNTY-IN-STOCK )

This determines the warehouse id and joins with the whse-items table and checks for the item in warehouse.If there are no stock,then based on the item number we join with supplier-delivery-items table to order the out-of stock item from supplier.**SUPPLIER-DELIVERY-ITEMS** (**DEL-ORDER#, ITEM#,** QNTY, SUP-ORDER#)

3)Order the product from supplier when it is out of stock in warehouse:

**SUPPLIER-ORDER ( SUP-ORDER#,** SALES-CONTRACT#, SUPPLIER# )

**SUPPLIER-ORDER-ITEMS ( SUP-ORDER#, ITEM#**, QNTY )

Here,based on the itemnumber which is out of stock in warehouse,the item is ordered from supplier using supplier-order-items table and joined with supplier-order table using sup-order# key field and corresponding sales contract details are stored.

4)Product delivery:

**DELIVERY-ORDER** ( **DEL-ORDER#,**  SALES-CONTRACT# )

**SALES-CONTRACTS** ( **SALES-CONTRACT#,** CUST# )

The above two tables are joined based on the sales-contract# key and to find the delivery details cust# key is retrieved and joined with customer table using cust# field **CUSTOMER** ( **CUST#**, CUST-EMAIL, CUST-ADDR ) to get the customer address for order delivery.

Once the item is packed for delivery, it has to be updated in the warehouse using the below table.

**WHSE-DELIVERY-ITEMS** ( **DEL-ORDER#, ITEM#,** QNTY, WHSE# )