Homework 2

**1. 3.3.5**

**a) R(A,B,C,D) with FD’s AB->C, C->D, D->A**

ALL FD: AB->C, C->D, D->A, DB->C, C->A, AB->D

**Violations**

AB->C and AB->D: the set closure AB+ is {A,B,C,D} therefore this AB is a superkey

C->D and C->A: The set closure C+ is {C,A,D} therefore C is not a superkey, so this is **a BCNF violation**

D->A: the set closure D+ is {D,A} therefore D is not a superkey, so this is a **BCNF violation**

DB->C : the set closure DB+ is {D, B, C, A} therefore DB is a superkey

**Decompose**

C->A R1 =C+ is {C, D,A} and R2= {C,B}

S1 = {C->D,C->A, D->A} and S2 = {empty}

**Recursive on R1**

C-> A and C-> D set closure C+ is {C,D,A}

D->A set closure D+ is {D,A}, **BCNF Violation**

Therefore R1.1 = {D,A} and R1.2 = {D,C}

**Answer:**

R1.1 = {D,A}

R1.2 = {D,C}

R2 = {C,B}

**b) R(A,B,C,D) with FD’s B->C and B->D**

**Violations**

B->C and B->D: set closure B+ is {B,C,D} therefore it is a **BCNF Violation**

**Decompose**

B-> C and B->D, R1 = {B,C,D} and R2 = {B,A}

S1 = {B->C,B->D} and S2 = {empty}

**Recursive on R1**

B->C, B->D, B+ is {B, C, D} therefore B is superkey, no violation

**Answer:**

R1.1 = {B,C,D}

R2 = {B,A}

**c) R(A,B,C,D) with FD’s AB->C, BC ->D, CD ->A and AD->B**

AB,BC,CD,AD are all keys, therefore there is no violation and {A,B,C,D} is already in BCNF

**d) R(A,B,C,D) with FD’s A->B, B->C, C->D, and D->A**

A,B,C,D are all keys therefore there is no violation and {A,B,C,D} is already in BCNF

**e) R(A,B,C,D,E) with FD’s AB->C, DE-> C and B->D**

**Violations**

AB-> C: the set closure AB+ is {A,B,C} therefore, AB is not a superkey and this is a **BCNF Violation**

DE-> C: the set closure DE+ is {D,E,C} therefore, AB is not a superkey and this is a **BCNF Violation**

B-> D: the set closure B+ is {B,D} therefore, AB is not a superkey and this is a **BCNF Violation**

**Decompose**

AB->C, R1 = {A,B,C} and R2 = {A,B,D,E}

S1 = {AB->C} and S2 = {B->D}

**Recursive on R2**

B->D, R2.1 = {B,D} and R2.2 = {B,A,E}

S2.1 = {B->D} and S2.2 = {empty}

**Answer:**

R1 = {A,B,C}

R2.1 = {B,D}

R2.2 = {B,A,E}

**f) R(A,B,C,D,E) with FD’s AB->C, C->D, D->B, D->E**

ALL FD: AB-> C, AB->D, AB->B, AB->E, C->D, C->B, C->E, D->B, D->E, AD->B, AD->E, AD ->C

AB->C, AB->D, AB->B, AB->E: the set closure AB+ is {A,B,C,D,E}, therefore AB is a superkey, no violation

C->D, C->B, C->E: the set closure C+ is {C,D,B,E} therefore C is not a superkey, **BCNF Violation**

D->B, D->E: the set closure D+ is {D,B,E}, therefore D is not a superkey, **BCNF Violation**

AD->B, AD->E, AD ->C: the set closure AD+ is {A,D,B,E,C} therefore AD is a superkey, no violation

**Decompose**

C->D,C->B.C->E: R1 = {C,D,B,E} and R2 = {C,A}

S1= {C->D,C->B,C->E} and S2 = {empty}

**Answer:**

R1 = {C,D,B,E}

R2 = {C,A}

**2. 3.4.1**

**a)B->E and CE->A**

**initial table:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **A** | **B** | **C** | **D** | **E** |
| **R1** | **a** | **b** | **c** | **d1** | **e1** |
| **R2** | **a2** | **b** | **C** | **d** | **e2** |
| **R3** | **a** | **b3** | **c** | **d3** | **e** |

**Final table:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **A** | **B** | **C** | **D** | **E** |
| **R1** | **a** | **b** | **c** | **d1** | **e1** |
| **R2** | **a2** | **b** | **C** | **d** | **e1** |
| **R3** | **a** | **b3** | **c** | **d3** | **e** |

Lossy because all rows still have scripted values

**b)AC->E and BC->D**

**initial table:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **A** | **B** | **C** | **D** | **E** |
| **R1** | **a** | **b** | **c** | **d1** | **e1** |
| **R2** | **a1** | **b** | **C** | **d** | **e1** |
| **R3** | **a** | **b1** | **c** | **d1** | **e** |

**Final table:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **A** | **B** | **C** | **D** | **E** |
| **R1** | **a** | **b** | **c** | **d** | **e** |
| **R2** | **a1** | **b** | **C** | **d** | **e** |
| **R3** | **a** | **b1** | **c** | **d** | **e** |

Lossless because the first row is unscripted

**c)A->D, D->E and B->E**

**initial table:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **A** | **B** | **C** | **D** | **E** |
| **R1** | **a** | **b** | **c** | **d1** | **e1** |
| **R2** | **a1** | **b** | **C** | **d** | **e1** |
| **R3** | **a** | **b1** | **c** | **d1** | **e** |

**Final table:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **A** | **B** | **C** | **D** | **E** |
| **R1** | **a** | **b** | **c** | **d** | **e** |
| **R2** | **a1** | **b** | **C** | **d** | **e** |
| **R3** | **a** | **b1** | **c** | **d** | **e** |

Lossless because the first row is unscripted

**d)A->D, CD->E and E->D**

**initial table:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **A** | **B** | **C** | **D** | **E** |
| **R1** | **a** | **b** | **c** | **d1** | **e1** |
| **R2** | **a1** | **b** | **C** | **d** | **e1** |
| **R3** | **a** | **b1** | **c** | **d1** | **e** |

**Final table:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **A** | **B** | **C** | **D** | **E** |
| **R1** | **a** | **b** | **c** | **d** | **e** |
| **R2** | **a1** | **b** | **C** | **d** | **e** |
| **R3** | **a** | **b1** | **c** | **d** | **e** |

Lossless because first row is unscripted

**3. 6.1.2**

a)Find the address of MGM studios

SELECT address

FROM Studio

WHERE name = ‘MGM’

b) Find Sandra Bullock’s birthdate

SELECT birthdate

FROM MovieStar

WHERE name = ‘Sandra Bullock’

c) Find all the stars that appeared either in a movie made in 1980 or a movie with ‘Love’ in the title

SELECT starName

FROM StarsIn

WHERE movieTitle LIKE ‘%love%’ OR movieYear = 1980

d) Find all executives worth at least $10,000,000

SELECT name

FROM MovieExec

WHERE netWorth >= 10000000

e) Find all the stars who either are male or live in Malibu

SELECT name

FROM MovieStar

WHERE gender = ‘male’ OR address LIKE ‘%Malibu%’

**4. 6.2.1**

a) who where the male stars in Titanic?

SELECT name

FROM StarsIn, MovieStar

WHERE MovieStar.name = StarsIn.starName AND gender = ‘male’ AND movieTitle = ‘Titanic’

b) which stars appeared in movies produced by MGM in 1995?

SELECT starName

FROM Movies, StarsIn

WHERE year = 1995 AND studioName = ‘MGM’ AND Movies.title = StarsIn.movieTitle

c) who is the president of MGM studios

SELECT MovieExec.name

FROM Studio, MovieExec

WHERE Studio.name = ‘MGM’ AND MovieExec. Cert# = Studio.presC#

d) which movies are longer than Gone With the Wind?

SELECT a.title

FROM Movies a, Movies b

WHERE a.length>b.length AND b.title = ‘Gone With the Wind’

e) which executives are worth more than Merv Griffin?

SELECT a.name

FROM MovieExec a, Movie Exec b

WHERE a.netWorth>b.netWorth AND b.name = ‘Merv Griffin’

**5. 6.3.1**

a) Find the makers of PC’s with a speed of at least 3.0

SELECT maker

FROM Product

WHERE model IN (SELECT model

FROM PC

WHERE speed >= 3.0)

b) Find the printers with the highest price.

SELECT MAX(price)

FROM Printer

c) Find the Laptops whose speed is slower than any PC

SELECT model

FROM Laptop

WHERE speed < ALL (SELECT MAX(speed) FROM PC)

d) Find the model number of the item (PC, laptop, or printer) with the highest price

SELECT model

FROM (SELECT model, price FROM PC) UNION (SELECT model, price FROM Printer) UNIONT (SELECT model, price FROM Laptop) a

WHERE price >= ALL (SELECT price FROM a)

e) Find the make of the color printer with the lowest price

SELECT DISTINCT maker

FROM Product, Printer

WHERE color = ‘true’ AND Printer.model = Product.model AND Printer.price <= ALL (SELECT price

FROM Printer WHERE color =‘true’)

f) Find the maker(s) of the PC(s) with the fastest processor among all those PC’s that have the smallest amount of RAM

SELECT DISTINCT maker

FROM Product, PC

WHERE Product.model = PC.model AND AND ram <= ALL (SELECT ram FROM PC) AND PC.speed >=

ALL (SELECT speed

FROM PC

WHERE ram = (SELECT MIN(ram) FROM PC))