

COMP9311 - Assignment 3

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Question 1

- i. (a) Since we don't have EF, so every candidate keys must include E and F ACEF BCEF
(b) Key = ACEF, $AD \rightarrow B$ violate BCNF
(c) {ABCDEF} FD = { $AD \rightarrow B$, $C \rightarrow D$, $BC \rightarrow A$, $B \rightarrow D$ } KEY = ACEF
to fix $AD \rightarrow B$, decompose into: {ABD}{ACDEF}
{ABD} FD = { $AD \rightarrow B$, $B \rightarrow D$ } KEY = AD
to fix $B \rightarrow D$, decompose into: {BD}{AB}
{ACDEF} FD = { $C \rightarrow D$ } KEY = ACEF
to fix $C \rightarrow D$, decompose into: {ACEF}{CD}
Therefore, the collection of BCNF is {AB, BD, CD, ACEF}
- ii. (a) AF CF
(b) KEY = AF, $BC \rightarrow E$ violate BCNF
(c) {ABCDEF} FD = { $BC \rightarrow E$, $C \rightarrow AB$, $AF \rightarrow CD$ } KEY = AF
to fix $BC \rightarrow E$, decompose into: {BCE}{ABCDF}
{BCE} FD = { $BC \rightarrow E$, $C \rightarrow B$ } KEY = C
{ABCDF} FD = { $C \rightarrow AB$, $AF \rightarrow CD$ } KEY = AF
to fix $C \rightarrow AB$, decompose into {ABC}{ABDF}
Therefore, the collection of BCNF is {ABC, ABDF, BCE}
- iii. (a) ABCF BCDF
(b) KEY = ABCF, $CD \rightarrow E$ violate BCNF
(c) {ABCDEF} FD = { $ABF \rightarrow D$, $CD \rightarrow E$, $BD \rightarrow A$ } KEY = ABCF
to fix $CD \rightarrow E$, decompose into: {CDE}{ABCDF}
{CDE} FD = { $CD \rightarrow E$ } KEY = CD
{ABCDF} FD = { $ABF \rightarrow D$, $BD \rightarrow A$ } KEY = ABCF
to fix $BD \rightarrow A$, decompose into: {ABD}{BCDF}
Therefore, the collection of BCNF is {ABD, BCDF, CDE}
- iv. (a) AB

- (b) KEY = AB, BCD→EF violate BCNF
- (c) {ABCDEF} FD = {AB→D, BCD→EF, B→C } KEY = AB
 to fix BCD→EF, decompose into: {BCDEF}{ABCD}
 {BCDEF} FD = {BCD→EF, B→C } KEY = BD
 to fix B→C, decompose into: {BC}{BDEF}
 {ABCD} FD = {AB→D, B→C } KEY = AB
 to fix B→C, decompose into: {BC}{ABD}
 Therefore, the collection of BCNF is {BC, ABD, BDEF}

Question 2

- i. Proj[Name](Company Join[Sector='Technology'] Category)
- ii. Proj[Code](Sel[Person < 5](Code g cout(Person)(Executive)))
- iii. Proj[Person](Sel[Code < 1](Person g cout(Code)(Executive)))
- iv. List the Industry which have only one Company:
 Rename[Proj[Industry](Sel[Code = 1](Industry g cout(Code)(Proj[Code, Industry](Category))))](R1)
 Then list the code of those company and its Industry:
 Proj[Code, Industry](R1 Join Category)

Question 3

	Expression	Max	Min
i.	R UNION (S INTERSECT T)	$r + \min(s, t)$	0, when $S \cap T = \emptyset$
	Sel[C](R x S)	$r * s$	0, if the condition can not meet
	R-PROJ[A](R JOIN S)	r , when $R \text{ Join } S = \emptyset$	0

Question 4

- (a)