CSC453 Homework 2 Due October 7th, 2018 at 11.00pm

Part C: Functional Dependencies

C-1 Transitive Dependency and Keys

You have a relation R(L,M,N,O,P,Q) R(A,B,C,D,E,F) and a set of functional dependencies F = {LNO→M, MN→LOP, N→O, OP→LN}.

- [2pt] Can we infer NP → LM from F ?

Yes,

N→O

NPO→L

NPOL→LM

Therefore NP→LM

- [3pt] Can we infer NQ → LO from F ?

No, you can only get N→O but we would need additional information to determine L

C-2 Keys

(i) [5pt] Find **all** the candidate keys of the Relation R(ABCDE) with FD's:

D → C, CE → A, D → A, and AE → D

BEC, BEA, BED

(ii) [5pt] Determine **all** the candidate and superkeys of the relation R(ABCDEF) with FD's:

AEF → C, BF → C, EF → D, and ACDE → F

Superkeys: ABEF, ABECD, ABEFC, ABEFD

Candidate Keys: ABEF & ABECD

C-3 Minimal Cover

[5pt] Find a minimal cover for the following set F of functional dependencies.

A→BC

AB→D

C→AD

D→B

Show your working clearly. Points will be deducted if you do not show the extraneous attributes, and their elimination.

A→B FD extraneous? Yes (A→C→D→B) REMOVE

A→C
AB→D
C→A
C→D
D→B

A→C
AB→D is A extraneous? Yes (A→C→D→B) REMOVE
C→A
C→D
D→B

A→C
B→D
C→A
C→D
D→B

Minimal Cover:
A→C
B→D
C→AD
D→B

C-4 Equivalence (15 points)
[10pt] Consider the following set of F.Ds. Determine if FD1 is equivalent to FD2 or to FD3:
FD1:
{BC->D, ACD->B, CG->B, CG->D, AB->C, C->A, D->E, BE->C, D->G, CE->A,CE->G}
FD2:
{AB->C, C->A, BC->D, CD->B, D->E, D->G, BE->C, CG->D}
FD3:
{AB->C, C->A, D->G, BE->C, CG->D, CE->G, BC->D, CD->B, D->E}

Is FD1 ⊆ of FD2 or FD3?

FD1's left hand attribute	FD1-closure	FD2-closure	FD3-closure	Same?
(BC)+	BCDEGA	BCADEG	BCADEG	Yes
(ACD)+	ACDBEG	ACDBGE	ACDGBE	Yes
(CG)+	CGBDAE	CGADBE	CGADBE	Yes
(AB)+	ABCDEG	ABCDEG	ABCDEG	Yes
(C)+	CA	CA	CA	Yes
(D)+	DEG	DEG	DGE	Yes
(BE)+	BECDAG	BECADG	BECGDA	Yes
(CE)+	CEAGBD	CEA	CEAGDB	ONLY FD3

FD1 ⊆ of FD3

FD3 $\subseteq$ of FD1?

FD3's left hand attribute	FD1- closure	FD3- closure	Same?
(BC)+	BCDEGA	BCADEG	Yes
(CD)+	ACDBEG	ACDGBE	Yes
(CG)+	CGBDAE	CGADBE	Yes
(AB)+	ABCDEG	ABCDEG	Yes
(C)+	CA	CA	Yes
(D)+	DEG	DGE	Yes
(BE)+	BECDAG	BECGDA	Yes
(CE)+	CEAGBD	CEAGDB	Yes

FD1 is equivalent to FD3