1. Consider the following relation r with attributes A, B, C, and D

(a) **Attribute B is a key in r.**

A key should be unique.

(b) **Functional dependency C -> D is satisfied by r**

The same value in attribute C has the same value in attribute D.

(c) **r does not satisfy C -> B**

The same value in attribute C has a different value in attribute B.

(d) **B -> ACD is satisfied by r**

Attribute B is a key in r so that B can determine other attributes.

2. $\mathcal{F}$ = {AG -> B, B -> CD, BD -> E, CE -> F} over R = ABCDEFG

(a) AG -> BDF

$\{AG\}^+$ = {**B**,CD,C,**D**,BD,E,**F**,**BDF**…}

(b) Compute $(B)^+$

$\{B\}^+$ = {**B**,CD,C,**D**,BD,E,CE,**F**,…}

(c) Find a key of R

$\{AG\}^+$ = {**B**,CD,C,**D**,BD,E,**F**,**G…**}, **AG is a key**

3. Give minimal covers of the following sets of functional dependencies

(a) {A -> B, B -> C, A -> C}

$\{A\}^+$ = {A,B,C}, F_{min} = {A -> B, B -> C}

(b) {ABCD -> CDEF}

F_{min} = {ABCD -> EF, ABCD -> F}

(c) {A -> BC, C -> D}

F_{min} = { A -> B, A -> C, C -> D }

(d) {AB -> CD, A -> B, B -> C}

F_{min} = { A -> B, B -> C, A->D }

(e) {A -> B, ABCD -> E, EF -> GH, ACDF -> EG}

F_{min} = { A -> B, ACD -> E, EF -> G, EF -> H }

4. Prove or disprove the following rules of inference

(a) Disprove

(b) Prove

(c) Disprove

5. dependencies B -> ACD and C -> D

(a) $\{B\}^+$ = {**B,A,C,D**)

(b) $\{A\}^+$ = {**A**)

(c) AB->A

6. AB -> C, C -> D, and D -> A

(a) NO, AB -> C, AB -> D, AB -> A (trivial)

(b) AB -> C, C -> D

(c) Yes

(d) AB -> C, C -> D

(e) Yes