Solution of quiz#4
Comp333

Consider relation R (A, B, C, D, E) that has the following FD's::

A-→BC FD1

CD-→E FD2

B-→D FD3

E-→A FD4

1) Candidate keys

1.1) $[A]^+$= {A, B, C) from FD1

$[A]^+$= {A, B, C, D} from FD3 and {B} subset {A, B, C) we add D to $[A]^+$

$[A]^+$= {A, B, C, D, E} from FD2 and {C, D} subset {A, B, C, D} we add E to $[A]^+$

So we can deduce all the attribute from A there for A is a candidate key.

1.2) $[E]^+$= {A, E) from FD4

$[E]^+$= {A, B, C, E} from FD1 and {A} subset {A, E) we add B, C to $[E]^+$

$[E]^+$= {A, B, C, D, E} from FD3 and {B} subset {A, B, C, E} we add D to $[A]^+$

So we can deduce all the attribute from E there for E is a candidate key.

1.3) $[CD]^+$= {C, D, E} from FD2

$[CD]^+$= {A, C, D, E} from FD4 and {E} subset {C, D, E} we add A to $[CD]^+$

$[CD]^+$= {A, B, C, D, E} from FD1 and {A} subset {A, C, D, E} we add B to $[CD]^+$

So we can deduce all the attribute from CD there for CD is a candidate key.

1.4) Using the same concept to prove BC also is a candidate key.

Note AC, ED, ACD, ABC are super keys not candidate keys

2) **Normalization as follow**

If we consider that A is the primary key, so we get the table {*A*, B, C, D, E}

To let the table satisfy first norm: B→D is nested table we get it out of the table above(that's to say remove D and create the table B → D.

The tables become:

B →D ……..1

A →BCE …….2

Notice the 2 tables are satisfied the 3 norms (1^{st},2^{nd},3^{rd}), but does not satisfy the BCNF since E →A(FD4), because of this we remove E from the table and create this table E→A

the system becomes:

B → D ……..1

A → BC . …….2

E → A ……..3

Every table in the system is normalized.