Sol 1: (a) No key is present.
No the decomposition is not good because it is lossless

(b) Candidate key is AB

It is good decomposition because it is lossless

(c) Candidate key is AC

It is already in BCNF ∴ No decomposition required.

(d) Candidate key is A

It is a good decomposition because it is lossless

(e) Candidate key is A

It is also a BCNF lossless decomposition ∴ it is a good decomposition

Sol 2: (a) $FD1 = \{ A \to B, B \to C, AB \to D \}$

$FD2 = \{ A \to B, B \to C, A \to C, A \to D \}$

$A^+ \to BCAD$

$B^+ \to CB$

$AB^+ \to BCDA$

$FD1 \subseteq FD2$

$A^+ \to BCDA$

$B^+ \to CB$

$FD2 \subseteq FD1$

Hence FD1 and FD2 are equivalent.

(b) $E = \{ A \to C, AC \to D, E \to AD, E \to H \}$

$G = A \to CD$
$E \to AH$

$A^+ \rightarrow ACD$

$AC^+ \rightarrow CDA$

$E \rightarrow EAH \cdot CD$

$F \subseteq G$

$A^+ \rightarrow ACD$

$E^+ \rightarrow EADHC$

$G \subseteq F$

Hence F and G are equivalent

Sol 3: we have been given.

$F = \{ AB \rightarrow C$, $C \rightarrow A$, $BC \rightarrow D$, $ACD \rightarrow B$, $D \rightarrow F$, $D \rightarrow G$, $BF \rightarrow C$, $FG \rightarrow B$, $CG \rightarrow D$, $CF \rightarrow A$, $CE \rightarrow G$

In ACD A is extra attribute so we can remove A.

$\therefore CD \rightarrow B$

$AB \rightarrow C$

$C \rightarrow A$

$BC \rightarrow A$

$CD \rightarrow B$

$D \rightarrow F$

$D \rightarrow G$

$BE \rightarrow C$

$CG \rightarrow B$

$CG \rightarrow D$

$CF \rightarrow A$

$CE \rightarrow G$

$\therefore C \rightarrow F$

Final minimal.

$AB \rightarrow C$

$C \rightarrow A$

$BC \rightarrow P$

$CD \rightarrow B$

$D \rightarrow EG$

$BF \rightarrow C$

$CG \rightarrow BD$

$CE \rightarrow G$

Sol 4: we have been given that (Empcode) as a P. is

Empcode → name, street, city, state of m.

F.D = { Pincode → city, state, street, city, state → pincode }

The given form is in 2 NF and hence also in 1NF

Sol 5: (1) The highest normal form is 1NF
BCNF (AB, CD, ACF)

(2) The highest normal form is 1NF ∴ BCNF decomposition AB, BF

(3) It is already in BCNF

(4) It is already in BCN

(5) It is already in BCNF

Sol 6: (1) (a) C.K → B

(b) R is in 2NF but not in 3NF

(c) C → D and C → A Both cause viol of BCNF.
One way to decom jose R into AC, BC and CD.

(2) (a) C.K → BD

(b) It is in 1NF not in 2NF

(c) AD, BC, BD is in BCNF.

(3) (a) C.K → ABC, BCD

(b) R is in 3NF but not BCNF

(c) No BCNF decompositio.

(4) (a) C.K → a

(b) R is in 2NF but not 3NF

(c) BCD, ABC in BCNF

(5) (a) C.K → AB, BC, CD, AD

(b) R is in 3NF but not BCN.

(c) No BCNF decomposition