Q1.

(1) No. F don't include J, so F^+ also don't include J, that's the reason why $C \rightarrow J \notin F^+$

(2) ABJ, AEJ.

(3) F_m ={AB→E,D→H,E→B,E→C,C→D,H→*G*,C→I}

(4)

For F_m ={AB→E,D→H,E→B,E→C,C→D,H→*G*,C→I}:

From AB→E, derive R_1{A,B,E}

From D→H, derive R_2{D,H}

From E→B, E→C, derive R_3{E,B,C}

From C→D, C→I, derive R_4{C,D,I}

From H→*G*, derive R_5{H,G}

None of the relation schemas contains a key of R, add one relation schema R_6{A,B,J}

Q2.

(1) $2*2^6-2^5 = 96$, ABCJ, ABDJ, ABEJ, ABGJ, ABHJ

(2) 1NF. None-prime attribute CE is functionally determined by AB, which is not satisfy the 2NF.

(3) F_1 ={AB→E,E→BCD}

F_2 ={H→G}

F_3 ={}

We need to verify if D→GH, C→DI, EH→I are inferred by $F_1 \cup F_2 \cup F_3$.

Since $D^+ | F_1 \cup F_2 \cup F_3$ = {D}, $C^+ | F_1 \cup F_2 \cup F_3$ = {C},$EH^+ | F_1 \cup F_2 \cup F_3$ = {BCDEHG},D→GH, C→DI, EH→I are not inferred by $F_1 \cup F_2 \cup F_3$. Thus, F_1, F_2 and F_3 are not dependency preserving regarding F'.

(4) No.

Decomposition	A	B	C	D	E	G	H	I	J
R_1(A,B,C,D,E)	a	a	a	a	a	b	b	b	b
R_2(E,G,H)	b	b	b	b	a	a	a	b	b
R_3(E,I,J)	b	b	b	b	a	b	b	a	a

Decomposition	A	B	C	D	E	G	H	I	J
$R_1(A,B,C,D,E)$	a	a	a	a	a	a	a	a	b
$R_2(E,G,H)$	b	a	a	a	a	a	a	a	b
$R_3(E,I,J)$	b	a	a	a	a	a	a	a	a

(5) $F_m = \{AB \to E, D \to H, E \to B, E \to C, C \to D, H \to G, C \to I\}$

Consider $AB \to E$ for F_m : $R_1(A,B,E)$, $R_2'(A,B,C,D,G,H,I,J)$

Consider $D \to H$ for R_2' : $R_2(D,H)$, $R_3'(A,B,C,D,G,I,J)$

Consider $C \to D$ for R_3' : $R_3(C,D)$, $R_4'(A,B,C,G,I,J)$

Consider $C \to I$ for R_4' : $R_4(C,I)$, $R_5(A,B,C,G,J)$

One of the possible lossless-join decomposition is R_1 ~ R_5