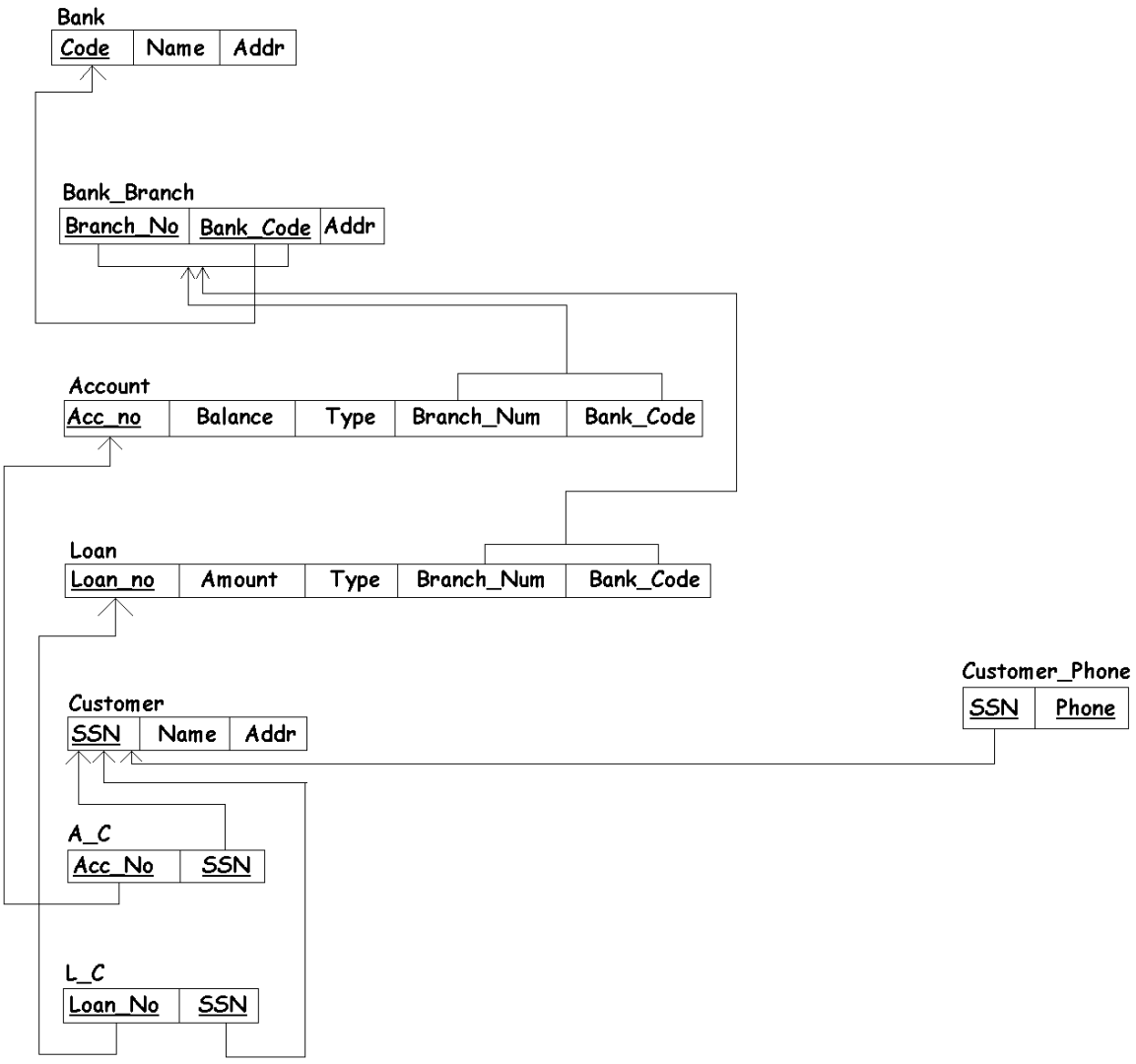
Soln 1)

Assumption: A customer may have multiple phone numbers.

(Link for diagram without this assumption:
https://drive.google.com/open?id=0B9QcN2kMKM_9VkMxdjJ6TmVQQk0)

SJSU ID: 010034700



Soln 2. a)

1NF – YES

- Has a PK and all columns other than PK depend on PK
- No multivalued/composite attributes
- No nested relations or repeating attributes

2NF – NO

- All non-key columns are not fully functionally dependent on the PK.
- There are partial dependencies ({A}->{D,E} and {B}->{F})

3NF – NO

- Not 2NF
- There are transitive dependencies ({A}->{D,E}, {D}->{I,J}, {B}->{F}, {F}->{G,H})

Soln 2.b)

For 1NF:

R = {A, B, C, D, E, F, G, H, I, J}
Here all non-PK columns depend on the PK.

For 2NF
The table in 1NF form has a PK, but there are partial dependencies present in the table. Hence, to normalize to 2NF, we have to remove those partial dependencies.

R1 = {A, B, C}	{A, B} -> {C}; no partial dependencies
R2 = {A, D, E, I, J}	{A} -> {D, E} and {D} -> {I, J}; {A} -> {I, J}; no partial dependencies
R3 = {B, F, G, H}	{B} -> {F} and {F} -> {G, H}; {B} -> {G, H}; no partial dependencies

For 3NF
The tables in 2NF do not contain partial dependencies, however, there are transitive dependencies present there. For 3NF normalization, we remove the transitive dependencies.

R1 = {A, B, C}	{A, B} -> {C}; no partial or transitive dependencies
R21 = {A, D, E}	{A} -> {D, E}; no partial or transitive dependencies
R22 = {D, I, J}	{D} -> {I, J}; no partial or transitive dependencies
R31 = {B, F}	{B} -> {F}; no partial or transitive dependencies
R32 = {F, G, H}	{F} -> {G, H}; no partial or transitive dependencies