William Frank
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Database Systems HW1

1. Car Dealership
   a) Instance Tables:

Cars:

VIN	Make	Model	Year	Color
0	Toyota	Tacoma	2008	Red
1	Toyota	Tacoma	1999	Green
2	Tesla	Model 3	2018	White
3	Subaru	WRX	2016	Blue
4	Ford	F150	2004	Red

Salespeople:

SSN	Name
0	Arnold
1	Jessica
2	Steve

Selling:

SSN	VIN
0	0
0	1
1	0
1	4
2	2

   b) If the Selling PK was just {SSN} then each VIN would have to be some kind of list, as each SSN would only get one row. This could be done by having one column for each car being sold, or to store a string list of VINs in one column. Alternatively, each salesperson would only be able to sell one car at a time.

   c) If the Selling PK was just {VIN} then the SSNs of salespeople selling a car would have to be some kind of list, as each VIN would only get one row. This could be done by having one column for each salesperson, or to store a string list of SSNs in one column. Alternatively, each car could only have one salesperson at a time.

2. Fill in the missing entries:

Attribute Sets	Possible Superkey?	Proper Subsets	Possible Key?
{A1}	No	{}	No
{A2}	No	{}	No
{A3}	No	{}	No
{A1, A2}	Yes	{A1}, {A2}, {}	Yes
{A1, A3}	No	{A1}, {A3}, {}	No
{A2, A3}	Yes	{A2}, {A3}, {}	Yes
{A1, A2, A3}	Yes	{A1, A2}, {A1, A3}, {A2, A3}, {A1}, {A2}, {A3}, {}	No

3. Pick the appropriate keys:
   a) PK{CardNum}
      UQ{Serial}

   b) PK{ISBN}
      UQ{Title, Author}

   c) PK{ISBN}
      UQ{Title, Author}
      UQ{Title}

   d) PK{CardNum, Phone}
      UQ{Phone}

4. Foreign Keys

   • CheckedOut.CardNum references Patrons.CardNum
   • CheckedOut.Serial references Inventory.Serial
   • Phones.CardNum references Patrons.CardNum
   • Titles.ISBN references Inventory.ISBN

5. Abstract Reasoning

   a) True, if a set is already a superkey then adding any additional attributes to it couldn't make the tuples non-unique.
   b) False, any set which has a superkey as a proper subset cannot be a key.
   c) True, if {x} is a key then it must also be a superkey.
   d) True, if {x} and {y} are both full of unique values then {x, y} must be too.
   e) False, {y} could be full of nothing but the same value and {x, y} would still be a superkey.
   f) False, consider {x} = {1, 2, 2}, {y} = {2, 2, 1}, and {z} = {2, 1, 2}. No column is a superkey, yet each row is unique.
   g) True, a valid schema must have a key.
   h) False, nothing can be known about <x, z> pairs, only that all {y} values are unique.