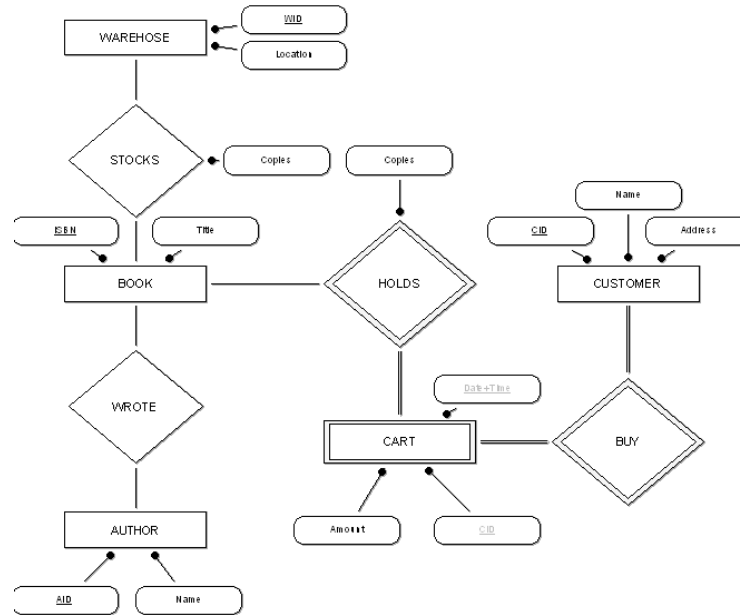


Homework 2 SOLUTIONS Spring 2012

1. E-R Conceptual Modeling

(a)



(b)

WAREHOUSE(WID, Location)
BOOK(ISBN, Title)
AUTHOR(AID, Name)
CART(CID, Date+Time, Amount)
CUSTOMER(CID, Name, Address)

STOCKS(WID, ISBN, Copies)
WRITES(AID, ISBN)
HOLDS(ISBN, CID, Date+Time, Copies)
no need for BUY (redundant)

c) This E-R diagram models an RDBMS system that needs to keep track of tables, columns, domains (types) and indices. Each column is of a unique domain (type) and it is not shared by multiple tables. Domains are shared by multiple tables. Alike tables, columns and domains, an index has a name and is created on one or more columns of a table. Its purpose is to speed up the search. A table may have none, one or more than one index. Provide the relationships among the above entities with the usual semantics. This is a meta-model describing a portion of the data dictionary.

2. Functional Dependencies

a).

$A^+=ABCDE$ sk $B^+=BD$ not sk $C^+=C$ not a sk $D^+=D$ not a sk
 $E^+=EABCD$ sk
 $BC^+=BCDEA$ sk $BD^+=BD$ not a sk
 $CD^+=CDEAB$ sk

Any three attribute key cannot include A, E, BC, CD because they would ne be minimal (candidate key's property). There are no 3 attribute combinations that do not include these.

b)

No. $B \rightarrow D$ and B^+ not a sk

c)

Every FD's left hand side is a sk except for $B \rightarrow D$. But D is included in a candidate key CD. Therefore R is 3NF.

d) R_1, R_2 is a LOSSLESS decomposition

$R_1 \cap R_2 = A$ and $A \rightarrow R_1$ and R_2 (it is a sk)

Not FD preserving. $B \rightarrow D$ is not preserved

R_3, R_4 is a LOSSLESS

$R_3 \cap R_4 = CD$ and $CD \rightarrow R_3$ and R_4 (it is a sk)

Not preserving. Again, $E \rightarrow A$ is not preserved

e) R_1 : BCNF

R_2 : BCNF

R_3 : 3NF

R_4 : BCNF

f)

$B \rightarrow D$ violates BCNF, split $R_5(B,D)$, $R_6(B,A,C,E)$

$R_5 \cap R_6 = B$ but $B \rightarrow R_5$ therefore lossless. And it is not preserving $CD \rightarrow E$