Student Name:_____

Student ID: _____

CSC3170 Introduction to Database Systems (Spring 2015) Assignment 1

Please answer all the questions below and hand in your answer to the submission box at the 10/F of SHB ***on or before 6th February 2015 4:00pm***

1. Consider the ER diagram in Figure 1. Suppose a periodical can be uniquely identified by its name and publish date, and a press can be uniquely identified by its name or its address (8 marks).

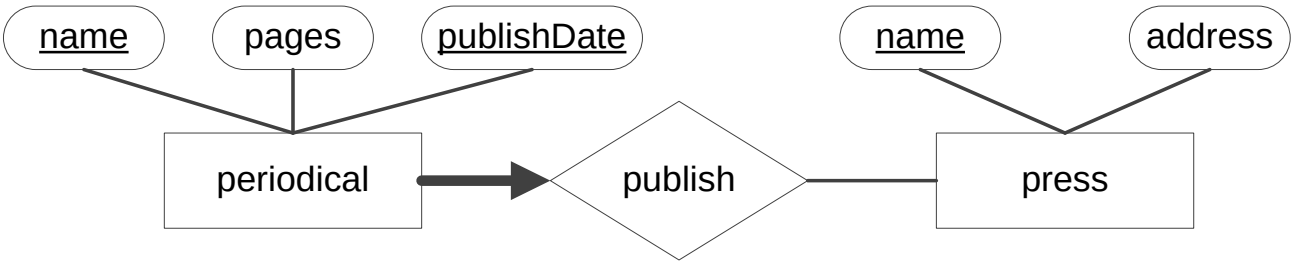


Figure 1: The ER diagram of libraries and periodicals

   a. List all the superkeys of periodical (1 marks).
   {name, publishDate}, {name, publishDate, pages}

   b. List all the candidate keys of periodical (1 marks).
   {name, publishDate}

   c. List the primary key of periodical (1 marks).
   {name, publishDate}

   d. List all the superkeys of press (1 marks).
   {name}, {address}, {address, name}

   e. List all the candidate keys of press (1 marks).
   {name}, {address}

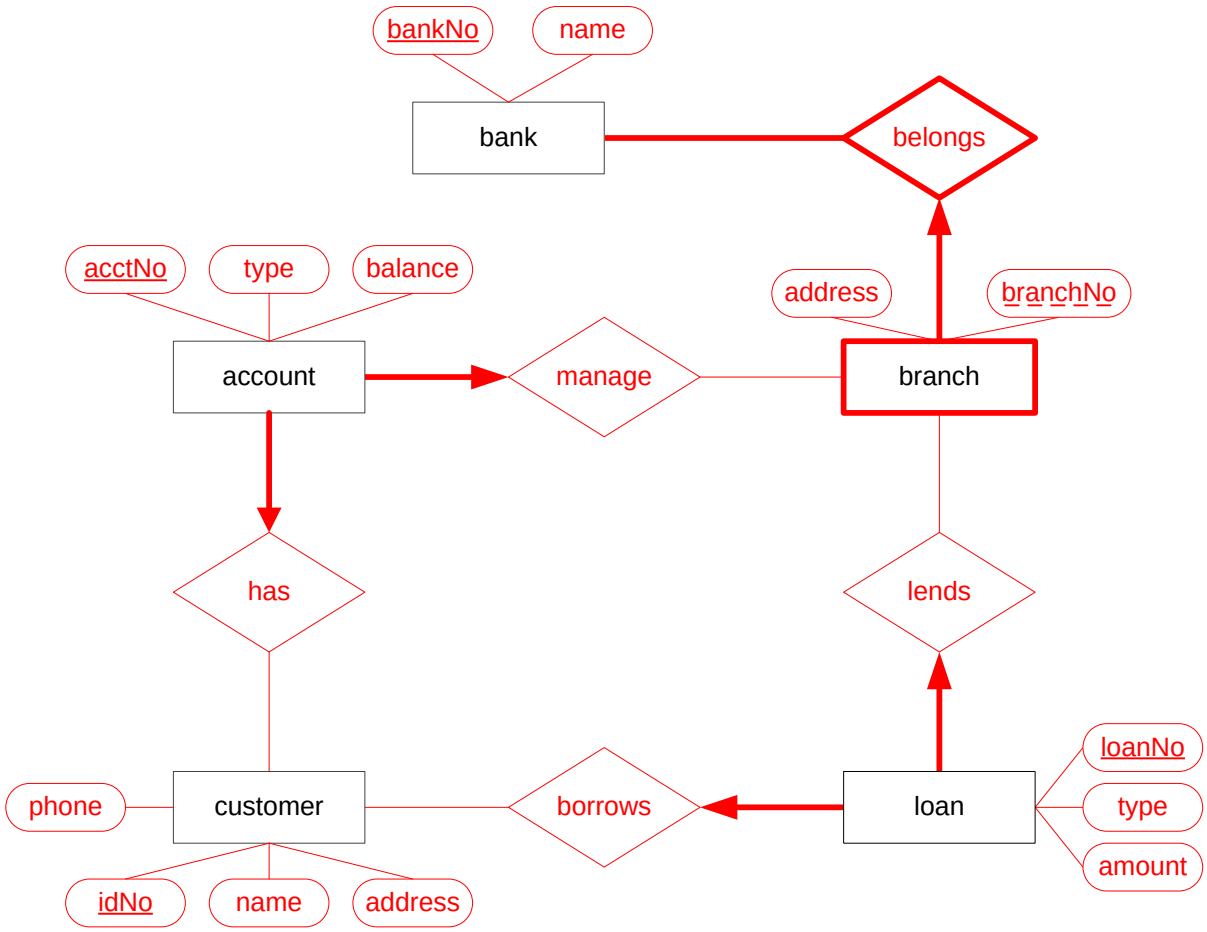
   f. List the primary key of press (1 marks).
   {name}

   g. What kind of relationship is “publish” (1 marks)? (one to one, one to many, many to one, many to many)
   One to many

   h. Explain the meaning of the thick arrow pointing from periodical to “publish” (1 marks).
   Every periodical must be published by only one press.

2. Consider the following requirements for a bank database (23 marks)
   - Each bank has attributes *bankNo* and *name.* It can be uniquely identified by *bankno*. Every bank must have at least one branch.
   - Each branch has attributes *branchNo* and *address.* It can be uniquely identified by *branchNo* within a single bank. Two branches can have the same *branchNo* if they belong to different banks.
   - A branch can manage multiple accounts and lend multiple loans.
   - An account has attributes *acctNo*, *type,* and *balance*. It can be uniquely identified by *acctNo*.
   - An account must be owned by one customer and managed by one branch.
   - A loan has attributes *loanNo, type*, and *amount.* It can be uniquely identified by *loanNo*.
   - A loan must be owned by one customer and managed by one branch.
   - Each customer has attributes *idNo*, *name*, *address,* and *phone.* It can be uniquely identified by *idNo*. A customer can have multiple accounts and borrow multiple loans in a branch.

   a. Complete the following ER diagram according to the database requirements above (16 marks).



   b. List all the strong entities, and their candidate keys (8 marks).
      - bank, candidate key: bankNo
      - account, candidate key: acctNo
      - loan, candidate key: loanNo
      - customer, candidate key: idNo

   c. List all the weak entities, and their partial keys and their identifying relationships (3 marks).
      - branch, partial key: branchNo, relationship: belongs

3. Suppose we replace the ternary relationship in figure 2 with three binary relationships in figure 3. Is figure 2 equivalent to figure 3 in terms of semantics (4 marks)?

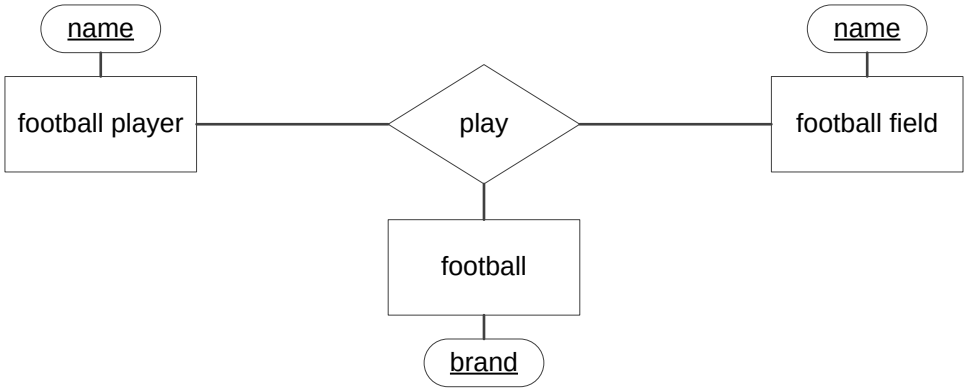


Figure 2: A ternary relationship

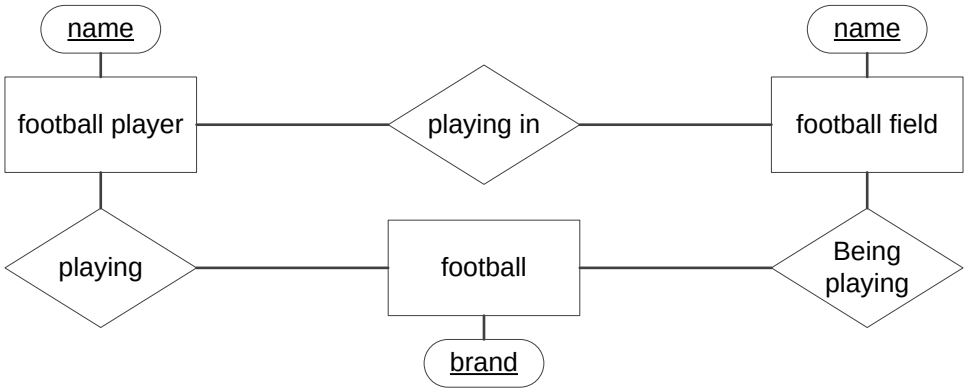


Figure 3: Three binary relationships

Suppose there're two football players, two football fields, and two football brands as follow:

football player's name	football field's name	football's brand
Peter	Chung Chi field	NFL
David	Sir Philip field	XYZ

In figure 2, (Peter, Chung Chi field, NFL) exists in the "play" relationship, meaning that Peter plays football at Chung Chi field with an NFL football.

In figure 3, (Peter, Chung Chi field) exists in the "play1" relationship, meaning that Peter plays football at Chung Chi field, but perhaps with an XYZ football. (Peter, NFL) exists in the "play2" relationship, meaning that Peter plays football with an NFL football, but perhaps at Sir Philip field. (Chung Chi field, NFL) exists in the "play3" relationship, meaning that perhaps David plays football at Chung Chi field with an NFL football.

In conclusion, (Peter, Chung Chi field, NFL) in figure 2 cannot be derived from (Peter, Chung Chi field), (Peter, NFL) and (Chung Chi field, NFL) in figure 3. Therefore, figure 2 is not equivalent to figure 3 in terms of semantics.

(Accept reasonable alternative answers)