

Relational Algebra Exercises

The following relational schema (in which primary keys are underlined) describes part of the operations of a bank. Note that each account may be owned by several customers and that each employee may be associated with several branches.

customer(ID, forename, surname, address, occupation)
account(accountno, type, balance, inBranch) - type is "deposit", "current", ...
owner(accno, custID)
branch(branchNo, braddress)
employee(staffNo, forename, surname, empbranch, supervisor)

1- Which are the foreign keys?

2 -Construct Relational Algebra expressions which describe the following information:

- a) All the types of account currently in existence.
- b) The account number, type and balance of all accounts at branch number 20.
- c) The ID and surname of the owner(s) of account number 23519.
- d) The account number and balance of any accounts owned by customers with the surname "Lalmas".
- e) The types of account for which there are no instances with a negative balance.
- f) The types of account for which there is at least one instance with a negative balance.
- g) The employee numbers of any employees employed at every branch.
- h) The branch number and address of any branches in which all accounts of type "deposit" have a positive balance.
- i) The full details of any accounts owned by customers giving their occupation as "lecturer".
- j) The full details of any customers having accounts with balances over £1,000,000, where the account is at a branch employing someone with the same surname as the customer.