

# Introduction to Database Systems

Recap

# Bank – Exercise 1

**Client(sid, name, surname, city, address, telephone);**

**Account(aid, sid, amount, currency);**

**Deposit**(did, aid, amount, name, surname, address, date);

**Withdrawal(aid, amount, name, surname, address, date);**

Write answers to the following questions in QBE.

- a) Print all deposits in the amount of 1.000€ or more and for clients called Tone.
- b) Print out the numbers of all the accounts to which more than 100,000€ has been deposited in the last month.

# Bank – Exercise 2

1 page on disk = 8K

|Client| = 100.000 records, 100 bytes, 80 records/page, 1250 pages

|Account| = 120.000 records, 80 bytes, 100 records/page, 1200 pages

|Deposit| = 1.000.000 records, 120 bytes, 66 records/page, 15151 pages

|Withdrawal| = 1.500.000 records, 120 bytes, 66 records/page, 22727 pages

How many pages does the following query return if we do not have any indexes? Assume that selection „Select [Amount>1000] (Deposit)“ matches 50% of records.

**Join(Select [amount>1000] (Deposit), Account, Deposit.rid=Account.rid)**

# Bank – Exercise 3

1 page on disk = 8K

|Client| = 100.000 records, 100 bytes, 80 records/page, 1250 pages

|Account| = 120.000 records, 80 bytes, 100 records/page, 1200 pages

|Deposit| = 1.000.000 records, 120 bytes, 66 records/page, 15151 pages

|Withdrawal| = 1.500.000 records, 120 bytes, 66 records/page, 22727 pages

What is the optimal query execution plan if the system has hash indexes and B+ trees. Demonstrate the overall procedure and the algorithms used to perform the relational algebra operations. This time assume that selection „Select [Amount>1000] (Deposit)“ matches 30% of records.

**Join(Select [amount>1000] (Deposit), Account, Deposit.riid=Account.riid)**

# Videocenter – Exercise 1

Films(fid,title,studio,producer,year);

Members(mid,name,surname,address,city,telephone);

Rental(rid,mid,fid,eid,date);

Employees(eid, name,surname,address,city,telephone);

Write SQL statements for the following queries:

- a) List first and last names of members who rented „Tu pa tam“ and live in Kranj.
  
  
  
  
  
  
  
  
  
  
- b) List the first name, last name and address of all members who have rented more than 20 „Lucasfilm“ films.

# Videocenter – Exercise 2

Films(fid,title,studio,producer,year);

Members(mid,name,surname,address,city,telephone);

Rental(rid,mid,fid,eid,date);

Employees(eid, name,surname,address,city,telephone);

- a) Using **relational algebra** list the titles of films that were rented by employees from Izola to members, who are not from Izola.
  
  
  
  
  
  
  
  
  
  
- b) Using **relational calculus** list first names and last names of members that rented every movie from the producer „David Lynch“.
  
  
  
  
  
  
  
  
  
  
- c) Using **QBE** solve example a)

# Videocenter – Exercise 3

1 page on the disk = 8K; Buffer can store 1000 pages

|Films| = 96.000 records, 80 records/page, 1.200 pages

|Members| = 120.000 records, 100 records/page, 1.250 pages

|Rental| = 800.000 records, 80 records/page, 10.000 pages

|Employees| = 400 records, 100 records/page, 4 pages

Assume that no index exists and that all selections are made after the join. How many pages does the following query read per each possible join?

```
SELECT fid, title FROM Rental R, Members M
WHERE R.date > '1/1/2012'
AND M.surname = „Novak“
AND Rental.mid = M.mid
```

# Videocenter – Exercise 4

1 page on the disk = 8K; Buffer can store 1000 pages

|Films| = 96.000 records, 80 records/page, 1.200 pages

|Members| = 120.000 records, 100 records/page, 1.250 pages

|Rental| = 800.000 records, 80 records/page, 10.000 pages

|Employees| = 400 records, 100 records/page, 4 pages

Analyse the optimal execution plan of the query from the previous task. You can use any join. Consider the following:

- we have connected B+ index on the attribute date of the relation Rental
- we have an unconnected hash index on the attribute mid of the relation Members
- 40% of all the rents happens after year 2011
- all the rents are randomly distributed among the members



# Library – Exercise 1

**Books(kid, author, title, publisher, year);**

**Member(cid, name, surname, address, telephone);**

**Rental(iid, cid, kid, zid, date);**

**Employee(zid, name, surname, address, telephone)**

Write SQL statements for the following queries:

- a) Print the names of members who have been borrowed a book written by the author with 'k' as the second letter in his name by the employee who lives in Koper.
  
  
  
  
  
  
  
  
  
  
- b) Print the name and surname of the member who has borrowed most books.
  
  
  
  
  
  
  
  
  
  
- c) Print the author who wrote the most books, among the books borrowed by Matija.

# Library – Exercise 2

**Books(kid, author, title, publisher, year);**

**Member(cid, name, surname, address, telephone);**

**Rental(iid, cid, kid, zid, date);**

**Employee(zid, name, surname, address, telephone)**

- a) Using relational algebra, list all publishers of the books borrowed by any member from ,Ljubljana' from the employee with the phone number ,040162534'.
  
  
  
  
  
  
  
  
  
  
- b) Using relational calculus, list all members who have borrowed every book by ,Strugatsky'.

# Library – Exercise 3

1 page on disk = 8K

|Books| = 1.000.000 records, 320 bytes, 25 records/page, 40000 pages

|Member| = 10.000 records, 200 bytes, 40 records/page, 250 pages

|Rental| = 300.000 records, 40 bytes, 200 records/page, 1500 pages

|Employee| = 100 records, 200 bytes, 40 records/page, 3 pages

The following query is given:

```
join( select[avtor=,Jančar'](Knjige),  
      select[datum=2008](Izposoja) )
```

How many pages does it read if we use block nested loops join? Assume, that it does not have any indexes. Write all additional assumptions that you used.

# B+ index – Exercise

**The following schema is given:**

Cd( cid, author, title, abbreviation, year)

Member ( lid, name, surname, address, email, phone)

Loan (iid, cid, lid, zid, date, loan\_term, comentary)

Employees (zid, name, surname, address, email, phone)

**Additional informations:**

1 page on the disk = 8K

|Cd| = 300.000 records, 400 bytes, 20 records/page, 15.000 pages

|Member| = 10.000 records, 200 bytes, 40 records/ page, 250 pages

|Loan| = 300.000 records, 100 bytes, 80 records/ page, 3750 pages

|Employees| = 100 records, 200 bytes, 40 records/ page, 3 pages

**Calculate the size of the B + index on the attribute Cd.title. Don't use rough estimations. Write down all the assumptions.**