

CSE 322 Final

Olcay Taner YILDIZ

I. QUESTION (24 POINTS)

Given k relations R_1, R_2, \dots, R_k , where R_k contains N_k tuples and $N_1 > N_2 > \dots > N_k > 0$, give the minimum and maximum possible sizes (in tuples) for the resulting relation produced by each of the following relational algebra expressions. Assume all operations are possible.

- $R_1 \cup R_2 \cup \dots \cup R_k$
- $R_1 \cap R_2 \cap \dots \cap R_k$
- $R_1 \times R_2 \times \dots \times R_k$
- $R_1 \bowtie R_2 \bowtie \dots \bowtie R_k$

II. QUESTION (24 POINTS)

Consider the following schema with the Sailors relation:

Sailors(sid:integer, sname:string, rating:integer, age:real)

For each of the following indexes, list whether the index matches the given selection conditions:

Index	Index fields	Condition
B+ index	sid	sid < 50
B+ index	sid	sid = 50
Hash index	sid	sid < 50
Hash index	sid	sid = 50
B+ index	sid, age	sid < 50 and age = 21
B+ index	sid, age	sid = 50 and age = 21
Hash index	sid, age	age = 21
Hash index	sid, age	sid = 50 and age = 21

III. QUESTION (24 POINTS)

In a simple file organization

- The number of data pages when records are packed onto pages with no space is 1024 (B).
- The number of records per page is 100 (R).
- The average time to read and write disk page is 10 milliseconds (D).
- The fanout is 32 (F).

Given the following two queries, 'SELECT sname FROM Suppliers WHERE sid = 34' and 'SELECT sname FROM Suppliers WHERE sid < 10', what is the total cost to process these two queries for

- 1) Heap file
- 2) File of supplier records sorted on sid
- 3) Clustered B+ tree file with search key sid (Assume %100 occupancy)
- 4) Heap file with an unclustered hash index on sid

Explain briefly how you have calculated the total cost for each case.

IV. QUESTION (28 POINTS)

- Give an example of Extendible Hashing where inserting an entry increases the global depth.
- Give an example of Linear Hashing where inserting an entry increases the global level.
- Give an example of B+ tree of depth 2 of order 2 where inserting a random entry **must** increase the depth of the tree.
- Give an example of B+ tree of depth 2 of order 2 where removing a random entry **must** decrease the depth of the tree.