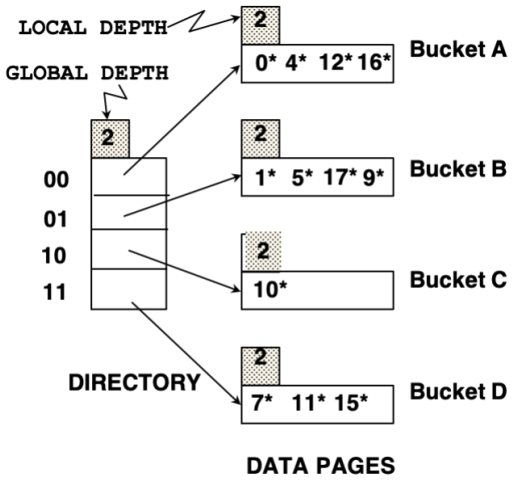
COMP 7640
Written Assignment #3

Due: 11:59 PM April 24 (Friday), 2025

Question 1. Given an extendible hashing index as shown in the figure below, where each bucket can contain 4 data entries,

(1) If we are given a query with the condition key=11, how many I/Os are needed for this query? (**6 marks**)

(2) Draw the resulting index after inserting 2* and then 8*. (**16 marks**)



Question 2. We are given two relations S and E, which contain 10,000 records and 1,000 records, respectively. Each disk page can hold 100 S records and 5 E records, respectively. Consider the relational operation $S \bowtie_{S.sid=E.sid} E$ and estimate the I/O costs of the following access paths.

(a) What is the lowest cost of using a page-oriented nested loop join? (**10 marks**)

(b) What is the lowest cost of using a simple-nested loop join? (**12 marks**)

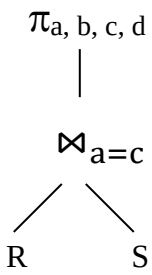
[**Remark**: There is no I/O cost for writing the result back to the disk.]

Question 3. Consider the query $\pi_{a,b,c,d}(R \bowtie_{a=c} S)$ with the following information:

a) Relation R(<u>a</u>, b, e) (a is the key) has 10 pages, and each R record needs 300 bytes;
b) Relation S(<u>c</u>, d, f, g) (c is the key) has 100 pages, and each S record needs 500 bytes;
c) Attributes a, b, c, and d take 100, 50, 100, and 150 bytes, respectively;
d) The page size is 1024 bytes;
e) Each S record joins with exactly one R record.

Estimate the total I/O cost for the following two query evaluation plans:

(1)

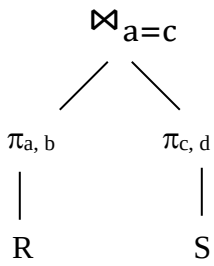


(On-the-fly)

(Page-Oriented Nested Loop Join)

(**10 marks**)

(2)



(Page-Oriented Nested Loop Join)

(Scan; write to temp T1)

(Scan; write to temp T2)

(**22 marks**)

Question 4. Given two relations S(SID, Name, GPA, age) and E(CID, SID, Date), and the following SQL query:

```
SELECT S.Name, S.GPA
FROM S, E
WHERE S.GPA>3.5 AND S.SID=E.SID
```

Draw three query evaluation plans for this SQL query. (**24 marks**)

❖

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Submission: Please submit your assignment via BUMoodle