0/6 Questions Answered

Vitamin 2

STUDENT NAME

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Q1 Ordering

1 Point

Order the following from largest to smallest in terms of layers of storing information in a relational database:

- ○ Files, records, pages
- ○ Pages, files, records
- ○ Files, pages, records
- ○ Records, pages, files

Save Answer

Q2 Free Space in Linked List

2 Points

Q2.1

Assume you have a heap file implemented in a linked list structure with the header page connected to a linked list of full pages, and connected to a linked list of pages with free space. There are 5 full pages and 10 pages with free space. In the worst case, how many

pages and 10 pages with free space. In the worst case, how many pages would you have to read to see if there is a page with enough space to store some record with a given size?

- ○ 5
- ○ 6
- ○ 10
- ○ 11

Q2.2

Same question as above, but now what if instead you had a page directory implementation of a heap file with 8 directory entries per header page (still 5 full pages, and 10 with free space)?

- ○ 2
- ○ 3
- ○ 8
- ○ 6
- ○ 11

Save Answer

Q3 Heap File vs Sorted File

2 Points

Answer the questions with the following assumptions:

1. Inserts and deletes only involve one record at a time
2. For Heap Files: Inserts always append to the end of the file
3. For Sorted Files: The files are sorted based on the sort key used during lookups

4. For Sorted Files: The page layout is packed

Q3.1

For which of these workloads should we use heap files over sorted files? Assume the operations listed in the answer choice are the only operations that we will do.

- [ ] frequent full scans, occasional inserts
- [ ] frequent deletes, occasional full scans
- [ ] frequent inserts, rare reads
- [ ] frequent selecting range of records by key, rare inserts
- [ ] frequent key look up, infrequent writes
- [ ] frequent updates, occasional reads

Q3.2

For which workloads should we use sorted files over heap files?

- [ ] frequent full scans, occasional inserts
- [ ] frequent deletes, occasional full scans
- [ ] frequent inserts, rare reads
- [ ] frequent selecting range of records by key, rare inserts
- [ ] frequent key look up, infrequent writes
- [ ] frequent updates, occasional reads

Save Answer

Q4 How Many Records?

2 Points

For the next two questions, consider the following schema:

```
CREATE TABLE Inventory (
  item_id integer PRIMARY KEY,
  quantity integer,
  item_description text
);
```

Q4.1

Given the schema above, at most how many variable-length records from this table can be stored in a 64 KB page (1 KB = 1024 Bytes)? Assume each page's footer contains a 10-byte area for the record count and pointer to free space, as well as a slot directory where it takes 4 bytes/record to store the pointer to the record in the page and 4 bytes/record to store the length of that record. Assume integers are 4 bytes each. Assume records do not have record headers or pointers to the variable-length fields in the records.

- ○ 2047
- ○ 2048
- ○ 4095
- ○ 4096

Q4.2

Assuming we are using the same schema from the last question,

but each record now also has a record header of 4 bytes, and for each variable-length field in the record, it has a 32-bit pointer to the end of the field's value, what is the size in bits of the smallest record possible?

- ○ 32
- ○ 64
- ○ 96
- ○ 128

Save Answer

Q5 Heap File vs Sorted File

3 Points

For the following questions, consider this SQL table:

```
CREATE TABLE Students (
  sid INT PRIMARY KEY,
  name VARCHAR(20),
  email VARCHAR(20),
  GPA float,
  years_enrolled INT
);
```

And the following 3 queries:

A:

```
SELECT * FROM Students WHERE years_enrolled >= 2;
```

B:

```
DELETE FROM Students WHERE sid = 123456;
```

C:

```
INSERT INTO STUDENTS VALUES (9999, 'Joe', j@b.com, 2);
```

For the following questions, assume we leave each page about 2/3 full. Order these queries in ascending order by the total number of I/Os required to execute them; ties can be listed in any order.

Q5.1

If the Students table is arranged in a heap file, what is the order of the queries?

- ○ A, B, C
- ○ A, C, B
- ○ B, A, C
- ○ B, C, A
- ○ C, A, B
- ○ C, B, A

Q5.2

If the Students table is arranged in a sorted file, sorted on SID, what is the order of queries? If there is a tie, select all possible answers.

- ☐ A, B, C
- ☐ A, C, B
- ☐ B, A, C

- [ ] B, C, A
- [ ] C, A, B
- [ ] C, B, A

Q5.3

What would be the size of a single tuple using fixed length records? Assume that integers and floats are 4 bytes long.

- ○ 56 Bytes
- ○ 52 Bytes
- ○ 40 Bytes
- ○ 16 Bytes

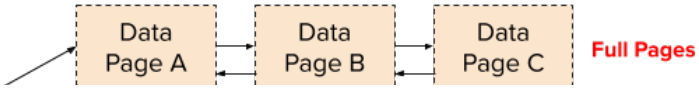
Save Answer

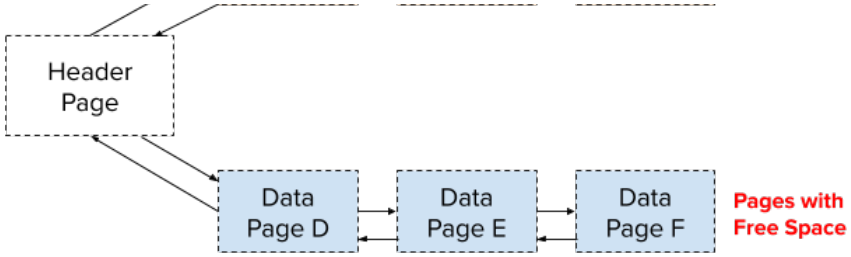
Q6 Whats the cost?

2 Points

Given the following Heap File with a Linked List implementation, what is the worst case cost in number of IOs to insert a record? Provide only a number in the box.

Assume the following:
1. Once a page is read into memory, it stays there and a subsequent read incurs no additional IO cost.
2. If a Free Space page becomes full after an insert, it is added to the front of the Full Pages list.





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