| Branch : CSE & IT | Batch : Vijay (Hinglish) |

Database management System

File Org & Indexing

Practice Set 05

[MCQ]

1. Assume a relational database system that holds relation: C(colleges) with the following characteristics

   - Records are stored as fixed length, fixed format records, length is 256 bytes.
   - There are 16384 records.
   - Records contains key attribute CollegeNumber (C.N), length 22 bytes and other fields.
   - Unspanned organization is used to store the information or record.

   Let's suppose we want to build a sparse primary index on C.N then how many numbers of 4096-byte blocks are needed to store the primary index when block pointer size is 10 bytes _____?

   (a) 7   (b) 8

   (c) 9   (d) 10

[NAT]

2. Assume a relational database system that holds relation: Product (P) with the following characteristics

   - Records are stored as fixed length, fixed format records, with the length of 256 bytes.
   - There are 262144 records.
   - Records contain attribute P.I (The identifier of the product involved), with the length 24 bytes, and an attribute P.C (the cost of product), with the length 32 bytes and other fields.
   - Unspanned organization is used to store the record.

   Assume that we want to build a dense secondary index on P.C, then how many numbers of 4096-byte blocks needed to store the dense secondary index. When record pointer size is 32 bytes? _____.

[MCQ]

3. Consider the following specification of system-

   Disk block size = 2048 bytes

   Block pointer size = 16 bytes

   Record pointer size = 20 bytes long

   file contains 30,000 records.

Each record of the file has the following fields:

Fields	Size (in Bytes)
EmpName	5
EmpNum	10
DeptNum	9
Addr	20
PhNum	9
DOB	1
Sex	1
Job	3
Sal	5

An extra/additional byte is used per record to represent end of the record.

What is the block factor of the database file assuming unspanned file organization?

(a) 16   (b) 32

(c) 48   (d) 64

[MSQ]

4. Which one of the following statements is/are True regarding indexing?

   (a) A database file can contain multiple clustered indexes.

   (b) A database file can consist of only one clustered index with multiple secondary indexes.

   (c) A database file can consist of multiple primary indexes.

   (d) A database file can consist of both primary and clustered index.

[NAT]

5. Consider a database of fixed-length records stored as an ordered file. The database has 25,000 records with each records being 100 bytes, of which the non-key attribute on which clustering index is formed occupies 10 bytes. The data file is completely block aligned.

   Suppose, block size, of the file system is 512 bytes and a pointer to the block occupy 5 bytes. You may assume that a binary search on an index file of b block may take $\lceil \log_2 b \rceil$ accesses in worst case.

Given that a cluster consumes 2 blocks, the number of block accesses required to identify the desired data in the worst case is _____.

[MCQ]

6. Consider the following statements-

   S₁: If the records of a relation X are physically ordered over a non-key field P and an index is build over the key-field of relation X, then the index is necessarily a secondary index over key attribute.

   S₂: More than one secondary indexes are possible.

   Which of the given statement(s) is/are CORRECT?

   (a) S₁ only

   (b) S₂ only

   (c) Both S₁ and S₂

   (d) Neither S₁ nor S₂

[NAT]

7. The order of a node in B⁺ tree is defined as the number of pointers it can hold. What is the maximum number of keys that a B⁺ tree of order 4 and height 4 can have ? _____

   (Assume that the height of a root node is 1)

[MCQ]

8. Given a block can hold either 3 records or 10 key pointers. A database contains P records, then how many blocks do we need to hold the data file and the dense index?

   (a) $\dfrac{P}{30}$

   (b) $\dfrac{P}{3}$

   (c) $\dfrac{13P}{30}$

   (d) $\dfrac{P}{10}$

[NAT]

9. The order of an internal node in B⁺ tree index is the maximum number of children it can have. Assume that a child pointer takes 6 bytes, the search field value takes 34 bytes and the blocks size is 2048 bytes. The order of the internal node is _____.

[NAT]

10. Assume a disk with block size B = 1024 Bytes, A block pointer is P_B = 12 bytes long and a record pointer is P_R = 18 bytes long. A file has 1,00,000 patients records of size 100 bytes. Suppose the file is ordered by the key field PID and we want to construct a secondary (dense) index on non-key field DeptID (14 bytes), then minimum of how many blocks are required to store index file assuming an unspanned organisation?

    (a) 3000   (b) 3100

    (c) 3125   (d) None of the above

[NAT]

11. The order of a node in B tree is the maximum number of block pointers it can hold. Given that the block size is 2K bytes, data record pointer is 8 bytes long, the search key is 9 bytes long and a block pointer is 5 bytes long. The best possible order of B tree node is_____.

[NAT]

12. The order of a leaf node (P) in a B⁺ tree is the maximum number of (value, data record pointer) pairs it can hold. Given that P=36, data record pointer is 8 bytes long, the search field is 6 bytes long and a block pointer is 8 bytes long. The permissible block size is_____.

[NAT]

13. (Assume that the level of root node is 1)

    The order of different nodes in B⁺ tree/B tree are given as-

    2 to P block pointers in root node.

    $\left\lceil \dfrac{P}{2} \right\rceil$ to P block pointers in internal node.

    $\left\lceil \dfrac{P}{2} \right\rceil - 1$ to (P–1) keys in leaf node.

    Let a and b be
    The minimum number of keys in
    B tree and B⁺ tree node of order
    P = 5 and level = 5. The value of (a + b) is_____.

[NAT]

14. (Assume that the level of root node is 1)

    The order of different nodes in B⁺ tree/B tree are given as-

    2 to P block pointers in root node.

    $\left\lceil \dfrac{P}{2} \right\rceil$ to P block pointer is internal node.

    $\left\lceil \dfrac{P}{2} \right\rceil - 1$ to (P–1) keys in leaf node.

    Let a and b be the maximum number of keys in B tree and B⁺ tree node of order P = 5 and level = 5. The value of (a +b) is_____.

[NAT]

15. Consider the keys (1– 5000) are going to be interested into a B⁺ tree. Assume, all the order are available before insertion. The orders P for B⁺ tree node is defined as-

2 to P pointer for root

$\left\lceil \dfrac{P}{2} \right\rceil$ to P pointer for another node.

The maximum possible levels in a B^+ tree index for P = 9 is _____.

(Assume that level of the root node is 1)

[MCQ]

16. Consider the following statements:
    S_1: In a B^+ tree, data pointers are stored only at the leaf nodes of the tree.
    S_2: The leaf node has an entry for every value of the search field, along with the data pointer to the record.

    Choose the correct statements.
    (a) Only S_1 is true
    (b) Only S_2 is true
    (c) Both S_1 and S_2 are true
    (d) Neither S_1 nor S_2 is true

[NAT]

17. Consider the keys (1– 5000) are going to be interested into a B^+ tree. Assume, all the order are available before insertion. The orders P for B^+ tree node is defined as-

    2 to P pointer for root

    $\left\lceil \dfrac{P}{2} \right\rceil$ to P pointer for another node.

    The minimum possible levels in a B^+ tree index for P = 9 is _____.

    (Assume that level of the root node is 1)

[NAT]

18. Consider a file of r = 40,000 records, each record is R = 100 bytes long and its kye field is of size v = 20 bytes. The file is ordered on a kye field, and the file organization is unspanned. The file is stored in a file system with block size B = 2000 bytes, and size of block pointer is 20 bytes. If the primary index is built on the key field of the file and multilevel index scheme is used to store the primary index, then the total number of blocks required by the multilevel index is_____.

Answer Key

1.	(b)	6.	(c)	11.	(93)	16.	(c)
2.	(4096)	7.	(255)	12.	(512)	17.	(4)
3.	(b)	8.	(c)	13.	(269)	18.	(41)
4.	(b)	9.	(52)	14.	(5624)		
5.	(10)	10.	(c)	15.	(6)		