File systems and Indexing

1) Given a B-tree where each node can contain at most 5 keys, determine the order of the B-tree.
2) Calculate the minimum height of a B-tree of order 4 (a 4-ary B-tree) that contains 1000 keys.
3) What is the maximum number of nodes in a B-tree of order 3 with height 3?
4) You are given a B-tree in which each node (except the root) has at least 3 keys and at most 6 keys. Determine the order mmm of the B-tree.
5) In a B-tree, suppose the search key is 8 bytes long, the disk block size is 1024 bytes, the record pointer is 8 bytes, and the block pointer is 8 bytes. Calculate the order of the B-tree node.

6) In a B tress suppose search key is 9 bytes long, disk block size is 512 B, record pointer is 7 B, block pointer is 6 B, then calculate the order of the B-tree node.
7) Consider a B-tree with key size 10 bytes, Block size 512 B, data pointer is 8 B and block pointer is 5 B. What is the order of B-tree?
8) Search key field is given as 9 bytes, block size is 512 B, record pointer pr is 7 B, block pointer p is 6 B, What is the order of internal nodes and leaf node of B+-tree.
9) A data file consisting of 1,50,000 student-records is stored on a hard disk with block size of 4096 bytes. The data file is sorted on the primary key RollNo. The size of a record pointer for this disk is 7 bytes. Each student-record has a candidate key attribute called ANum of size 12 bytes. Suppose an index file with records consisting of two fields, ANum value and the record pointer the corresponding student record, is built and stored on the same disk. Assume that the records of data file and index file are not split across disk blocks. The number of blocks in the index file is
10) Consider a database implemented using B+ tree for file indexing and installed on a disk drive with block size of 4 KB. The size of search key is 12 bytes and the size of tree/disk pointer is 8 bytes. Assume that the database has one million records. Also assume that no node of the B+ tree and no records are present initially in main memory. Consider that each record fits into one disk block. The minimum number of disk accesses required to retrieve any record in the database is
11) In a file which contains 1 million records and the order of the tree is 100, then what is the maximum number of nodes to be accessed if B+ tree index is used?

12) In a B+ tree, if the search -key value is 8 bytes long, the block size is 512 bytes and the block pointer size is 2 bytes, then maximum order of the tree is

13) The order of leaf node in B+ - tree is the maximum number of (value, data record pointer) pairs it can hold. Given that the block size is 1K bytes, data record pointer is 7 bytes long,
the value field is 9 bytes long and a block pointer is 6 bytes long, what is the order of the leaf node?

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

15) Consider a B+ tree in which the search key is 12 bytes long, block size is 1024 bytes, record pointer is 10 bytes long and block pointer is 8 bytes long. The maximum number of keys that
can be accommodated in each non-leaf node of the tree is .

16) Calculate the order of leaf (Pleaf) and non leaf (P) nodes of B+ tree based on the information given below:
search key field: 12 field
Record Pointer: 10 bytes
Block Pointer: 8 bytes
Block Size: 1KB

In case of leaf node order is defined as pair of key and record pointer

A) Pleaf : 51 and P: 46
B) Pleaf : 47 and P: 52
C) Pleaf : 46 and P: 51
D) Pleaf : 52 and P: 47

17) Consider a file of 16384 records. Each record is 32 bytes long and its key field is of size 6 bytes. The file is ordered on a non-key field, and the file organization is unspanned. The
file is stored in a file system with block size 1024 bytes, and the size of a block pointer is 10 bytes.
If the secondary index is built on the key field of the file, and a multi-level index scheme is used to
store the secondary index, the number of first-level and second-level blocks in the multi-level index

are respectively
A) 8 and 0
B) 128 and 6
C) 256 and 4
D) 512 and 5

18) In a database file structure, the search key field is 9 bytes long, the block size is 512 bytes, a record pointer is 7 bytes and a block pointer is 6 bytes. The largest possible order of a
non-leaf node in a B+ tree implementing this file structure is

19) Consider a table T in a relational database with a key field K. A B-tree of order p is used as an access structure on K, where p denotes the maximum number of tree pointers in a B-tree
index node. Assume that K is 10 bytes long; disk block size is 512 bytes; each data pointer PD is 8
bytes long and each block pointer PB is 5 bytes long. In order for each B-tree node to fit in a single
disk block, the maximum value of p is

20) A B+-tree index is to be built on the Name attribute of the relation STUDENT. Assume that all student names are of length 8 bytes, disk blocks are of size 512 bytes, and index
pointers are of size 4 bytes. Given this scenario, what would be the best choice of the degree (i.e. the
number of pointers per node) of the B+-tree