Assignment 3

Consider a computer with a memory hierarchy as shown below (next page). The primary memory has 2t memory cells. It is random access and implemented as an array--any element can be accessed directly. *All computational operations can be performed only on keys that are there in the primary memory.* Also, the time taken to access an element in this memory is fast--1 time unit.

The secondary memory is implemented as a two dimensional array of NX2t dimensions. Intuitively, each row stands for a block on the secondary memory. As such, the secondary memory can only be accessed at the granularity of a row. For example, the entire B1 can be loaded into the primary memory, but not individual elements B[1][j]. *Therefore, you can readDisk(B[i]) and writeDisk(B([j]) commands only that can touch the secondary memory.* Time taken for each of these operations is 10 units.

Let t be 10. N can be as much as you want (as big a secondary memory as you want).

Write programs to store data in your computer as:

- B-Tree: insert/search and delete operations **(20 marks)**
- Binary Search Tree: insert/search and delete operations. **(20 marks)**

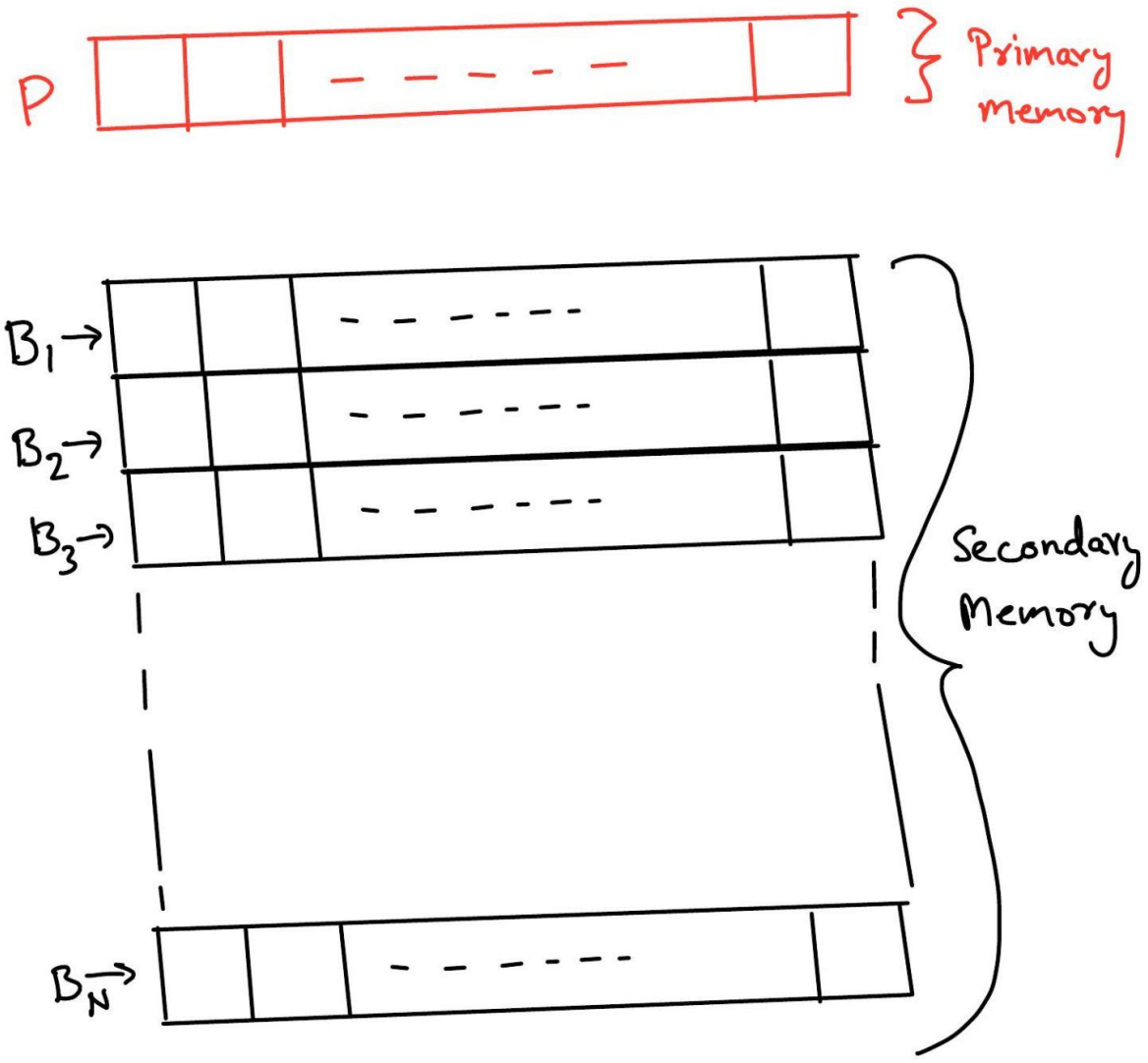
You can assume there are 60 keys and order of the keys is as follows: 17 13 2 27 48 54 39 57 60 3 23 46 16 18 49 45 33 36 55 19 47 35 7 22 4 50 9 56 37 12 11 21 31 38 29 44 8 26 25 40 6 58 51 1 15 30 52 10 28 59 53 34 43 42 24 14 32 41 5 20

Search for: 49, 27, 22, 38, 11, 55, 7, 35 and 59

Delete: 13, 19, 24, 37, 43, 53, 18, 38 and 58.

Report the time taken for creation of the data structures, search time and delete time. The time taken has to be calculated as per the cost mentioned above. **(5 + 5 marks)**

(**10 marks** for good code design, commenting and readability)


P
Primary Memory
B_1
B_2
B_3
B_N
Secondary Memory