“数据结构与算法“模拟试题-1

一、单项选择题（本大题共 15 小题，每小题 2 分，共 30 分）提示：在每小题列出的四个备选项中只有一个是符合题目要求的，请将其代码填写在答题纸上。错选、多选或未选均无分。

1. An array is (　　)
   (A) A contiguous block of memory locations where each memory location stores a fixed-length data item.
   (B) An ADT composed of a homogeneous collection of data items, each data item identified by a particular number.
   (C) a set of integer values.
   (D) a and b.

2. Pick the growth rate that corresponds to the most efficient algorithm as n gets large: (　　)
   (A) 5n
   (B) 20 log n
   (C) $2n^2$
   (D) 2^n

3. When the upper and lower bounds for an algorithm are the same, we use: (　　)
   (A) big-Oh notation.
   (B) big-Omega notation.
   (C) Theta notation.
   (D) asymptotic analysis.

4. When comparing the doubly and singly linked list implementations, we find that the doubly linked list implementation (　　)
   (A) Saves time on some operations at the expense of additional space.
   (B) Saves neither time nor space, but is easier to implement.
   (C) Saves neither time nor space, and is also harder to implement.
   (D) Saves time and space together.

5. Huffman coding provides the optimal coding when: (　　)
   (A) The messages are in English.
   (B) The messages are binary numbers.
   (C) The frequency of occurrence for a letter is independent of its context within the message.
   (D) Never.

6. The primary access function used to navigate the general tree when performing UNION/FIND is: (　　)

(A) leftmost child

(B) right child

(C) right sibling

(D) parent

7. When sorting n records, Insertion sort has best-case cost: ( )

(A) O(log n).

(B) O(n).

(C) O(n log n).

(D) $O(n^2)$

8. When sorting n records, Selection sort will perform how many swaps in the worst case? ( )

(A) O(log n).

(B) O(n).

(C) O(n log n).

(D) $O(n^2)$

9. The basic unit for disk allocation under DOS or Windows is: ( )

(A) A byte.

(B) A sector.

(C) A cluster.

(D) A track.

10. When properly implemented, which search method is generally the most efficient for exact-match queries? ( )

(A) Binary search.

(B) Dictionary search.

(C) Search in self-organizing lists

(D) Hashing

11. A good hash function will: ( )

(A) Use the high-order bits of the key value.

(B) Use the middle bits of the key value.

(C) Use the low-order bits of the key value.

(D) Make use of all bits in the key value.

12. Indexing is: ( )

(A) Random access to an array.

(B) The process of associating a key with the location of a corresponding data record.

(C) Using a hash table.

(D) None of the above.

13. A 2-3 tree is a specific variant of a: ( )
    (A) Splay tree.
    (B) B-tree.
    (C) BST.
    (D) Trie.

14. The single-source shortest path problem can be used to: ( )
    (A) Sort all of the graph vertices by value.
    (B) Sort all of the graph vertices so that each vertex is listed prior to any others that depend on it.
    (C) Sort all of the graph vertices by distance from the source vertex.
    (D) None of the above.

15. A topological sort requires all of the following except: ( )
    (A) The graph be directed.
    (B) The graph contain no cycles.
    (C) The graph contain weights on the edges.
    (D) None of the above.

二、判断题（本大题共 5 小题，每小题 2 分，共 10 分）提示：正确打 T，错误打 F，将其结果填写在答题纸上。

1. Given two hash function $\boldsymbol{h_1}$ and $\boldsymbol{h_2}$ and key k_1, If $\boldsymbol{h_1}(k_1) = \boldsymbol{h_2}(k_1)$, then we say that $\boldsymbol{h_1}$ and $\boldsymbol{h_2}$ have a collision. ( )
2. The number of leaves in a non-empty full binary tree is one more than the number of internal nodes. ( )
3. A serious disadvantage for Mergesort is that it requires twice the amount of space of sorting data. ( )
4. For given set of elements, the shape of the corresponding BST is unique, and it is independent of the order in which elements are inserted. ( )
5. Linked lists are better than array-based lists when implementing lists whose number of elements varies widely or is unknown. ( )

三、名词解释题（本大题共 3 小题，每小题 5 分，共 15 分）。提示：解释每小题所给名词的含义，若解释正确则给分，若解释错误则无分，若解释不准确或不全面，则酌情扣分。

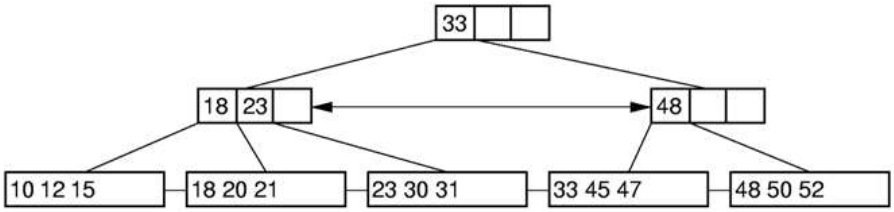
1. Full Binary Tree
2. Data structure
3. interleave factor

四、应用题（本大题共 4 小题，每小题 5 分，共 20 分）。提示：请给出准确答案，如果有中间步骤，答案错误的情况下有步骤分。

1. AVL tree of input sequence

   16, 3, 7, 11, 9, 26, 18, 14, 15

2. Draw the binary tree represented by A'B'/DC'E'G/F'HI
3. Proof: To any binary tree, if it has n_0 leaf node, n_2 internal node of degree=2, $n_0=n_2+1$
4. Insert 14, 19, 22, 23 to B^+ tree in sequence



五、编程题（本大题共 2 小题，共 25 分）。提示：每小题给出了一个程序设计要求，请按照要求写出源程序代码，如果源程序代码中出现语法错误或逻辑错误，则酌情扣分。

1. Write a function to calculate the depth of a binary tree(共 10 分)
2. Write a recursive function named printRange that, given the pointer to the root to a BST, a low key value, and a high key value, prints in sorted order all records whose key values fall between the two given keys. Function printRange should visit as few nodes in the BST as possible. (共 15 分)