“数据结构与算法”模拟试题－2

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

1. Searching for all those records in a database with key value between 10 and 100 is known as:
   a) An exact match query.
   b) A range query.
   c) A sequential search.
   d) A binary search.

2. If a sequence has n values, then the number of permutations for that sequence will be
   a) n
   b) n^2
   c) n^2 - 1
   d) 2^n
   e) n!

3. Asymptotic analysis refers to:
   a) The cost of an algorithm in its best, worst, or average case.
   b) The growth in cost of an algorithm as the input size grows towards infinity.
   c) The size of a data structure.
   d) The cost of an algorithm for small input sizes

4. We use a comparator function in the Dictionary class ADT:
   a) to simplify implementation.
   b) to increase the opportunity for code reuse.
   c) to improve asymptotic efficiency of some functions.

5. If a node is at position r in the array implementation for a complete binary tree, then its right child is at:
   a) (r - 1)/2 if r > 0
   b) 2r + 1 if (2r + 1) < n
   c) 2r + 2 if (2r + 2) < n
   d) r - 1 if r is even
   e) r + 1 if r is odd.

6. We use the parent pointer representation for general trees to solve which problem?
   a) Shortest paths
   b) General tree traversal
   c) Equivalence classes
   d) Exact-match query

7. 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)
   e) O(n!)
   f) None of the above.

8. The basic unit of I/O when accessing a disk drive is:
   a) A byte.
   b) A sector.
   c) A cluster.
   d) A track.
   e) An extent.

9. When properly implemented, which search method is generally the most efficient for exact-match queries?
   a) Sequential search.
   b) Binary search.
   c) Dictionary search.
   d) Search in self-organizing lists
   e) Hashing

10. The primary difference between a B+-tree and a B*-tree is:
   a) The B+-tree store records only at the leaf nodes.
   b) The B+-tree has a higher branching factor.
   c) The B+-tree is hight balanced.
   d) The B+-tree is smaller.

11. Dijkstra's algorithm requires that vertices be visited in:
   a) Depth-first order.
   b) Breadth-first order.
   c) Order of distance from the source vertex.
   d) No particular order.

12. If R is a binary relation over set S, then R is transitive if
   a) aRa for all a in S.
   b) whenever aRb, then bRa, for all a, b in S.
   c) whenever aRb and bRa, then a = b, for all a, b in S.
   d) whenever aRb and aRc, then aRc, for all a, b, c in S.

13. When we wish to describe the upper bound for a problem we use:
   a) The upper bound of the best algorithm we know.
   b) The lower bound of the best algorithm we know.
   c) We can't talk about the upper bound of a problem because there can always be an arbitrarily slow algorithm.

14. A full binary tree is one in which:
   a) Every internal node has two non-empty children.
   b) all of the levels, except possibly the bottom level, are filled.

15. An entry-sequenced file stores records sorted by:
   a) Primary key value.
   b) Secondary key value.
   c) Order of arrival.
   d) Frequency of access.

二、名词解释题（本大题共 3 小题，每小题 4 分，共 12 分）提示：对题目名词进行解释，英文缩写的需要给出全称并解释。

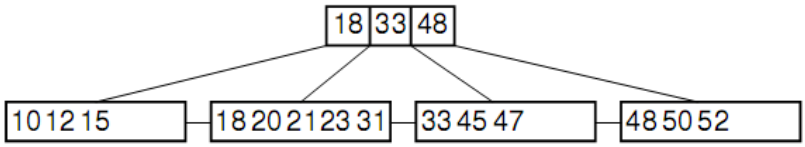
1. DAG
2. Locality of Reference
3. ADT

三、应用题（本大题共 4 小题，1-3 小题每小题 8 分，4 小题 9 分，共 33 分）。

1. Build the Huffman coding tree and determine the codes for the following set of letters and weights:

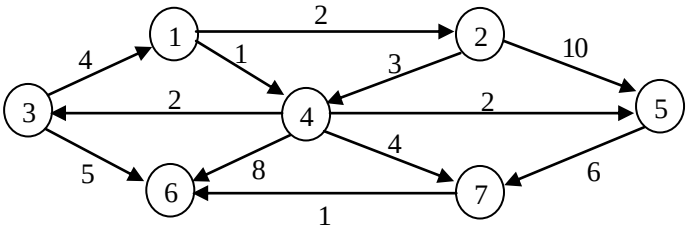
a	b	c	d	e	f	g	h
2	3	5	11	13	19	31	45

2. Insert 30 to the B+ tree of order four.



3. Build a hash table of 62, 25, 52, 75, 89, 07, 65, 32, 19, 31, using hash function H(key) = key MOD 13 and closed hashing d=1 to solve collisions. The size of hash table n=13.

4. Dijkstra shortest path. Show the process of Dijkstra's algorithm operating on the following graph.



四、编程、设计及分析题（本大题共 2 小题，共 25 分）。提示：题目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 height of a binary tree.（10 分）

2. Use singly linked lists to implement integers of unlimited size. Each node of the list should store one digit of the integer. Write a function to implement subtraction operation. Limit exponents to be positive integers. What is the asymptotic running time for your operation, expressed in terms of the number of digits for the two operands?（15 分）