

呼吸

知

A. BDECA

B. DBECA

C. DEBCA

D. BCDEA

6 Which number is possible the number of inner nodes of a B-tree of order 4 with height 5?

( )

A. 14

B. 7

C. 86

D. 65

7 Given an undirected graph with 100 vertices, how many edges does it have at most?

A. 5000

B. 5050

C. 4900

D. 4950

8 Assume there is a ordered list consisting of 100 data items, using binary search to find a special item, the maximum comparisons is ( ).

A. 9

B. 8

C. 7

D. 6

9 In the average case, which one of the following sort algorithms has the least efficiency for time? ( )

A. Heap sort

B. Quick sort

C. Merge sort

D. Insertion sort

10 Which one of the following sort algorithms is most suitable for external sorting? ( )

A. Heap sort

B. Quick sort

C. Merge sort

D. Insertion sort

## II. Answer the following questions (Each 10 points and total 40 points)

1 Given a weighted graph  $G=(V, E)$  with  $V=\{1,2,3,4,5,6,7\}$ ;

$E=\{(1,2)3,(1,3)5,(1,4)8,(2,5)10,(2,3)6,(3,4)15,(3,5)12,(3,6)9,(4,6)4,(4,7)20,(5,6)18,(6,7)25\}$ ,

please use Kruskal's Algorithm to build a minimum-cost spanning tree  $T$  by adding edges to  $T$  one at a time.

2 Assume a list is  $\{48,35,64,92,77,13,29,44\}$ , firstly insert these items to an empty complete Binary Tree according to the sequence one by one, then please heapify the complete Binary Tree and implement the heap sort. Please draw the whole heapifying process and sorting process.

3 Let T be a initially empty AVL tree, draw the process of inserting 1, 11, 2, 13, 17, 7, 5, and 3 into T one by one, and write down the balance factors for each node and every rotating types if any.

4 Given Hash function  $H(k)=3k \bmod 11$ , and the key sequence {32,13,49,24,38,21,4}. The size of Hash table is 11.

(1) Construct the hash table with the linear probe open addressing used to resolve collisions. (6 points)

(2) Calculate the average search length for successful and unsuccessful search under the equal probability. (4 points)

### III. Design algorithms (total 20 points)

1 An undirected graph G is represented by Adjacency Lists.

(1) Write a function to calculate the degree of G in C++ language. (6 points)

(2) Point out the time complexity of this function. (2 points)

2 We call the element in the position  $L/2$  from an ascending sequence S with length L the median. For example, if a sequence S1 is (11,13,15,17,19), then its median is 15. The median of two ascending sequences is the median of the combined ascending sequence by these two sequences. For example, if a sequence S2 is (2,4,6,8,20), then the median of S1 and S2 is 11. There are two ascending sequences A and B with the same length L, please design an algorithm to calculate the median of A and B.

(1) Describe the idea of your algorithm in detail. (4 points)

(2) Write this algorithm in C++ language. Annotations in key points are required. (6 points)

(3) Point out the time complexity and space complexity of your algorithm. (2 points)