國立中山大學107學年度碩士暨碩士專班招生考試試題

科目名稱：資料結構【電機系碩士班丙組】　　題號：431004

※本科目依簡章規定「可以」使用計算機（廠牌、功能不拘）（選擇題）　　

Note: There are 20 questions in total. Each one is 5 points. Please choose one answer for each question. No extra points will be deducted for wrong answers.

1. Suppose a node in a linked list A contains two fields, data and link, where link is the pointer to the following node. Let head_ptr be a pointer to the first node of A. Suppose we would like to traverse all the nodes of A by the loop "while (!head_ptr) $\{B;\}$". What is B? (a) head_ptr == NULL; (b) head_ptr = $\star$(head_ptr) $\rightarrow$ link; (c) head_ptr = head_ptr $\rightarrow$ link; (d) $\star$head_ptr = $\star$(head_ptr) $\rightarrow$ link.
2. Suppose we have a tree where the left subtree of its root contains 2500 nodes and the right subtree contains 200 nodes. How many nodes are processed before the root node for the post-order traversal? (a) cannot be determined; (b) 2500; (c) 200; (d) 2700.
3. For any general tree, which of the following statements is false? (a) Pre-order traversal makes sense; (b) Post-order traversal makes sense; (c) In-order traversal makes sense; (d) No traversals make sense.
4. Suppose a binary search tree is built with the following words (inserted in this order): blueberry, peach, orange, banana, pear, cherry, mango. How many comparisons are needed to search for the word mango? (a) 5; (b) 4; (c) 3; (d) 2.
5. What is the prefix expression of $(((3+7)\times(3/5))-(4\times 2))$? Note that each operand is a one-digit number. (a) $-\times+/\times 373542$; (b) $-\times+37/35\times 42$; (c) $373542\times/+\times-$; (d) $-\times/+3735\times 42$.
6. What is the value of the postfix expression $293/\times 4-9+$? Note that each operand is a one-digit number. (a) 11; (b) 13; (c) 15; (d) 17.
7. Consider a complete binary tree with exactly 10000 nodes, implemented with an array. Suppose that a node has its value stored at index 4999 in the array. What index is the value stored at for this node's parent? (a) 1499; (b) 1450; (c) 2499; (d) 2450.
8. Consider a complete binary tree with exactly 10000 nodes, implemented with an array. Suppose that a node has its value stored at index 4999 in the array. What index is the value

stored at for this node's right child? (a) 9998; (b) 9999; (c) 10000; (d) The node has no right child.

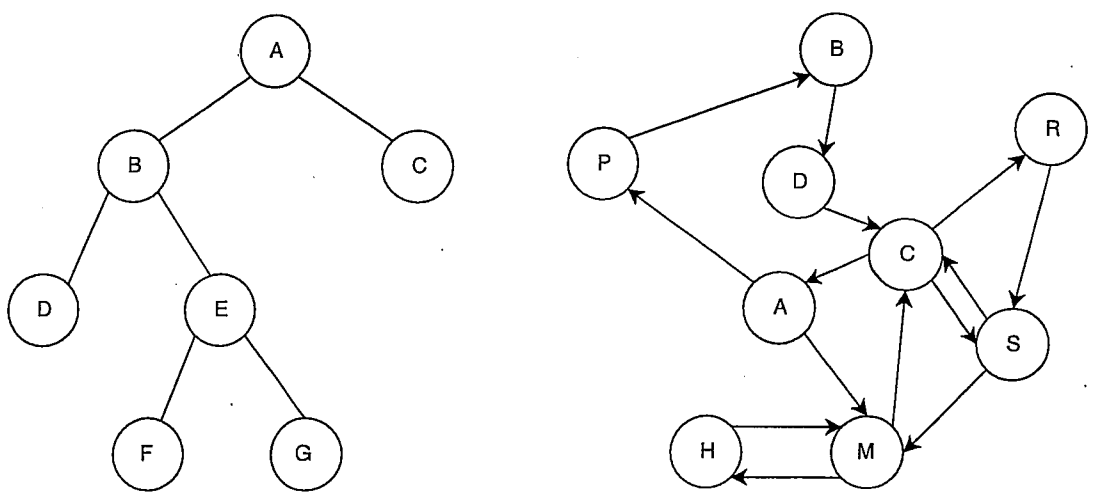
9. Consider the tree in Figure 1(a). What is the order of the nodes processed in the in-order traversal? (a) D-F-B-E-G-A-C; (b) D-B-F-E-G-A-C; (c) D-B-F-G-E-A-C; (d) D-B-F-E-A-G-C.
10. Consider the tree in Figure 1(a). What is the order of the nodes processed in the pre-order traversal? (a) A-B-E-D-F-G-C; (b) A-B-F-E-D-G-C; (c) A-B-D-G-F-E-C; (d) A-B-D-E-F-G-C.
11. Start with an empty max-heap of integers, and enter the ten numbers 1 through 10. Let the max-heap be stored in an array. What index is 8 stored at in the array? (a) 2; (b) 3; (c) 4; (d) 5.
12. Start with an empty max-heap of integers, and enter the ten numbers 1 through 10. Let the max-heap be stored in an array. Remove one entry from the heap. What index is 3 stored at in the array? (a) 5; (b) 4; (c) 3; (d) 2.
13. Suppose you are given an array containing six integers 5, 36, 4, 20, 19, and 9 initially. Starting with 5, use insertionsort to sort the array in increasing order. What is the content of the array after 4 is processed? (a) 4, 5, 20, 36, 19, 9; (b) 5, 36, 4, 9, 19, 20; (c) 4, 5, 19, 36, 20, 9; (d) 4, 5, 36, 20, 19, 9.
14. Suppose you are given an array containing six integers 1, 2, 3, 4, 5, and 6 initially. You want to sort the array in increasing order. Which sorting method is the most efficient to use? (a) selectionsort; (b) insertionsort; (c) mergesort; (d) quicksort.
15. Feature A: The worst-case running time is $O(n \log n)$; Feature B: No additional memory is required. Which of the following sorting methods has both features A and B? (a) heapsort; (b) quicksort; (c) insertionsort; (d) mergesort.
16. Consider the graph in Figure 1(b). Starting with node S, what is the order of the nodes processed by the depth-first search? If two or more nodes can be chosen, choose the node with the smallest label first. (a) S-C-A-P-B-M-H-D-R; (b) S-M-H-C-A-P-B-D-R; (c) S-C-A-M-H-P-B-D-R; (d) S-C-R-A-M-H-P-B-D.

17. Consider the graph in Figure 1(b). Starting with node S, what is the order of the nodes processed by the breadth-first search? If two or more nodes can be chosen, choose the node with the smallest label first. (a) S-C-A-M-R-H-P-B-D; (b) S-C-M-A-H-B-P-R-D; (c) S-C-M-A-R-P-B-H-D; (d) S-C-M-A-R-H-P-B-D.

18. Suppose you are doing a breadth-first search of a graph with n nodes. How large can the queue get during the search? (a) n; (b) $n-1$; (c) $n-2$; (d) 1.

19. An empty hash table has a capacity of 13, and you insert six entries with keys 20, 15, 7, 9, 21, 33, and 48. Using linear probing and the hash function $x\%(13)$, what index 21 is stored at in the table? Note that % is the remainder operator, e.g., (100)%(13)=9. (a) 7; (b) 8; (c) 9; (d) 10.

20. An empty hash table has a capacity of 13, and you insert six entries with keys 20, 15, 7, 9, 21, 33, and 48. Using linear probing and the hash function $x\%(13)$, what index 48 is stored at in the table? Note that % is the remainder operator, e.g., (100)%(13)=9. (a) 10; (b) 11; (c) 12; (d) 9.



(a) A binary tee (b) A graph

Figure 1: Two figures.

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