

國立屏東商業技術學院九十二學年度碩士班入學考試試題

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資料結構

注意：

1. 本試題共有二大題。第一大題為單選題，共 15 題，每題均有四個選項；第二大題為演算題。請依序並標明題號作答於答案卷上。

2. 試題須隨答案卷一併繳回。

一、單選題(共 15 題，45%)

1. Which of the following statements is incorrect ?

(A) A forest is a set of $n \geq 1$ disjoint trees.

(B) $f(n) = O(g(n))$ iff there exist two constants c and n_0 such that

$|f(n)| \leq c |g(n)|$ for all $n \geq n_0$.

(C) Every binary tree is uniquely defined by its preorder and inorder sequences.

(D) All B-trees of order 2 are fully binary trees.

2. The binomial coefficient can be recursively computed by

$C(n, m) = C(n-1, m) + C(n-1, m-1)$, where $C(i, j) = 1$ if $i = j = 0$ or $i = j$. $C(4, 3) = ?$

(A) 7 (B) 6 (C) 5 (D) 4

3. Which of the following sorting techniques is stable ?

(A) merge sort (B) quick sort (C) heap sort (D) selection sort

4. If $a=2$, $b=3$, $c=6$ and $d=8$, then the result of evaluating the postfix expression

$cab+-bda/+*a*b+$ is _____.

(A) 14 (B) 15 (C) 16 (D) 17

5. How many distinct binary trees are there with 4 nodes?

(A) 13 (B) 14 (C) 15 (D) 16

6. The worst case insertion time for a height balanced tree with n nodes is _____.
(A) $O(n)$ (B) $O(\log n)$ (C) $O(n \log n)$ (D) $O(n^2)$
7. What is the minimum number of key values in a B-tree of order 4 (if height=5)?
(A) 30 (B) 31 (C) 32 (D) 33
8. The postorder and inorder representations of a binary tree are DBEFCA and DBAECF, respectively. What is the result using the preorder traversal?
(A) BEFACD (B) CABDEF (C) ABDCEF (D) ABCDEF
9. Work through binary search on an ordered file with keys (15, 21, 25, 31, 49, 51, 69, 70, 74, 85, 87). What is the number of key comparisons made while failure searching for key 22?
(A) 2 (B) 3 (C) 4 (D) 5
10. Given a file with keys (15, 8, 20, 7, 66, 54), what is the second pass result of the file by bubble sort in ascending order?
(A) (8, 7, 15, 20, 54, 66) (B) (8, 15, 7, 20, 54, 66)
(C) (8, 15, 7, 20, 54, 66) (D) (8, 15, 20, 7, 66, 54)
11. `int F(int a, int b) { if ((a>0)&&(b>0)) return (F(a-1,b)+F(a,b-1)); else return (a+b) }` What is the final value of $F(3,2)$?
(A) 14 (B) 15 (C) 16 (D) 17
12. Euler showed that there is a walk starting at any vertex, going through each edge exactly once and terminating at the start vertex iff the degree of each vertex is _____.
(A) odd (B) integer (C) even (D) real
13. Which of the following sorting techniques has the best time complexity in the worst case?
(A) bubble sort (B) quick sort (C) heap sort (D) selection sort

14. Let G be an undirected graph with any two vertices connected by at most one edge. Which of the following statements is correct?
- (A) Any two spanning trees of G should have a common edge.
 - (B) Minimal cost spanning tree of G is unique.
 - (C) The path from vertex 1 to vertex 2 on a minimal cost spanning tree of G is a shortest path from 1 to 2.
 - (D) All spanning tree of G has the same number of edges.

15. Which of the following is correct?

- (A) $2^{\log n} > \log^2 n > 6n \log n > \log \log n > 2^{100}$
- (B) $2^{\log n} > 2^{100} > \log^2 n > 6n \log n > \log \log n$
- (C) $2^{\log n} > 6n \log n > \log^2 n > \log \log n > 2^{100}$
- (D) $2^{\log n} > 2^{100} > 6n \log n > \log^2 n > \log \log n$

二、演算题(共 5 题, 55%)

1. Given an undirected graph $G(V, E)$, write an algorithm to determine if it is a connected graph. (15%)
2. Write a C or C++ program to implement a stack based on the following codes :


```
typedef struct MyStack {
    int          data;
    struct MyStack *next;
}Stack;
Stack *top = 0 ;
```

 Two functions: *push(int d)* and *pop()*, must be implemented for your stack. You also need to write a main function to show how you use the stack. (10%)
3. $T(2) = 1$, $T(n) = 2T(n^{1/2}) + 1$, $T(n) = O(g(n))$, $g(n) = ?$ (10%)
4. Assume that the probabilities of the symbols A, B, C, D, and E are 0.25, 0.15, 0.20, 0.10, and 0.30, respectively. Construct a Huffman tree. What is the Huffman code of the message AABBCCDDEE? (10%)
5. Give the definition of a B-tree and create the B-tree of order 5 for the following keys: 1, 7, 6, 2, 11, 4, 8, 13, 10, 5, 19, 9, 18, 24, 3, 12, 14, 20, 21 and 16. (10%)