

系所組別：會計學系乙組

考試科目：資料結構

考試日期：0223，節次：3

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

一 選擇題 (40%)

- Assume a sequence list 1, 2, 3, 4, 5, 6 is passed as a stack, an possible output sequence list is _____.
A. 2, 4, 5, 1, 6, 3 B. 3, 2, 5, 6, 4, 1 C. 1, 5, 4, 6, 2, 3 D. 5, 3, 6, 2, 1, 4
- Let $g(n) = 2n \log n + n - 5$, $f(n) = 2n^6 + 3n^4 - 100n^2 + 1$ Which of the following statements is true?
A. $g(n) = \Theta(n^2)$ B. $g(n) = \Omega(n^2)$ C. $f(n) = \Theta(n^4)$ D. $f(n) = \Omega(n^6)$
- Which of the following statements are true?
A. The postfix expression of $1/2+3*4-5$ is $12/34*+5-$.
B. The prefix expression of $1/2+3*4-5$ is $-+/125*34$.
C. The infix expression of $12345/+*-$ is $(1/2+3)*4-5$.
D. The postfix expression of $1/(2+3)*4-5$ is $123+4/*5-$.
- In the following sorting algorithm, _____ is an unstable algorithm and the worst time complexity is $O(n \log n)$.
A. the Insertion Sort B. Quick Sort C. Merge Sort D. the Heap Sort
- If a queue contained the entries x, y, z (from head to tail), which of the following would be the contents after one entry r was inserted and one entry was removed?
A. w, x, r B. r, y, z C. y, z, r D. r, w, x
- In a connected graph with n vertexes, the minimum number of edges is _____.
A. $(n-1)/2$ B. $n(n-1)/2$ C. n-1 D. $n(n-1)$
- Which of the following trees is identical to a binary search tree, except that for every node in the tree, the difference between the heights of the left and right sub-trees is never larger than 1?
A. AVL tree B. B+ tree C. Splay tree D. Red-Black tree
- What is the formula for finding the entry in the m-th row and n-th column of a two-dimensional array if it is stored in row major order rather than column major order? Assuming the number of elements per row is c.
A. $(c * n) + x$ B. $(c * m) + n$ C. $c * (m + n)$ D. $c + m * n$
- Heap is a useful data structure. Which of the following sequence of keys is a heap?
A. 04,15,31,23, 52,72 B. 94,52,31,72,15,23
C. 15,52,23,94,31,72 D. 94,31,52,23,15,72
- A string $t = \text{'a good student'}$, then $\text{substr}(t,3,3) = \underline{\hspace{2cm}}$. $\text{substr}(\text{str}, \text{start}, \text{length})$
A. ent B. goo C. ood D. a g

(背面仍有題目，請繼續作答)

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二 問答題

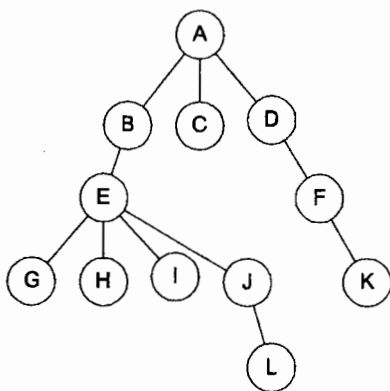
1. (3%) Consider the following function that returns the address of a stack-allocated local variable:

```
char *fun ( void )
{
    Char *a = "a sunny day";
    char *ptr = a;
    ptr = (char *) malloc(10 * sizeof(char));
    return a;
}
```

Explain a problem that may occur when function fun returns?

2. (22%) Consider the Tree T_1 . Do each of the following:

- A. Transform Tree T_1 to Binary tree T_{BT} . (6%)
- B. The depth of T_{BT} = _____ (2%)
- C. The leaf node of T_{BT} = _____ (2%)
- D. The post-order traversal of T_{BT} = _____ (4%)
- E. Show the steps of inserting the keys $a, d, e, i, j, k, l, f, g$, into an initially empty re-black tree (8%)



Tree T_1

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3. (15%) Consider the following circular queue with front=3 and rear=0.

Q[0]	Q[1]	Q[2]	Q[3]	Q[4]	Q[5]
A				C	B

Now suppose we execute the following 5 instructions: "insert D", "insert E", "Delete", "Insert F" and "Delete". Draw the status of the circular queue and the values of front and rear after each of the five instructions is executed.

4. (10%) Suppose that a hash table contains hash_size=13 entries indexed from 0 through 12 and that the following keys are to be mapped into the table:

10 160 32 45 58 125 3 29 20 450 0

- Determine the hash addresses and find how many collisions occur when these keys are reduced by applying the operation $\% \text{hash_size}$.
- Find a hash function that will produce no collisions for these keys. (A hash function that has no collisions for a fixed set of keys is called perfect.)

5. (10%) Assume there is a string, e.g., $a[100] = \{ 'a', 'd', 'b', 'c', 'd', 'd', 'e', 'd', 'f', 'a', 'k', 'c', 'd' \}$. Please design an algorithm to remove the duplicate characters.