

國立臺灣師範大學 100 學年度碩士班招生考試試題

科目：電子計算機概論

適用系所：圖書資訊學研究所

注意：1.本試題共 3 頁，請依序在答案卷上作答，並標明題號，不必抄題。2.答案必須寫在指定作答區內，否則不予計分。

1. Explain the following terms (Don't just translate them into Chinese). (20 分)
 - (1) Trojan Horse
 - (2) Stack
 - (3) Proxy Server
 - (4) Domain Name Service

2. Answer the following questions. (20 分)
 - (1) The 8-bit two's complementation notation of the integer -27 is _____.
 - (2) The result of performing a three-bit right circular shift on the bit string 01101101 is _____.
 - (3) Theta notation (θ) is one notation to classify algorithms according to their efficiency. Rank the following classes of algorithms, $\theta(n^2)$, $\theta(e^n)$, $\theta(n \lg n)$, and $\theta(n \lg \lg n)$, according to their efficiency (from the most efficient to the least).
 - (4) The approach that a CPU should be designed to execute a minimal set of machine instructions lead to a type of computer design called _____.
 - (5) _____ is the condition in which two or more processes are blocked from progressing because each is waiting for a resource that is allocated another.
 - (6) Suppose a digital camera has a storage capacity of 256MB. How many photographs could be stored in the camera if each consisted of 1024 pixels per row and 1024 pixels per column and each pixel required three bytes of storage?
 - (7) In the object-oriented paradigm, a template for a collection of objects is called a _____.
 - (8) Which of the following programming languages is not an object-oriented programming language: C, C#, C++, and JAVA?
 - (9) The data structure _____ is used to record the memory location where a data item is stored.
 - (10) The protocol used to transfer mails between mail servers as well as to send a new message from its sender's local machine to the sender's mail server is _____.

3. A well-known sorting algorithm is the **bubble sort**. It is based on the process of repeatedly comparing two adjacent entries of a list and interchanging them if they are not in correct order relative to each other. Let us suppose that the list in question has N entries. The bubble sort

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would begin by comparing (and possibly interchanging) the entries in positions N and $N-1$. Then, it would consider the entries in positions $N-1$ and $N-2$, and continue moving forward in the list until the first and second entries in the list had been compared (and possibly interchanged). Observe that this pass through the list will pull the smallest entry to the front of the list. Likewise, another such pass will ensure that the next to the smallest entry will be pulled to the second position in the list. Thus, by making a total of $N-1$ passes through the list, the entire list will be sorted (If one watches the algorithm at work, one sees the small entries bubble to the top of list). (12 分)

- (1) Use the list 6, 2, 18, 10, 3, 12, 1, 9 as an example to demonstrate the process of the bubble sort (from the smallest to the largest) **in detail**.
- (2) How many comparisons are needed to sort the above list? How many interchanges occur?
- (3) In general, sorting a list of N entries by bubble sort needs how many comparisons?

4. What is an optimal Huffman code for the following set of characters and their corresponding frequencies? ($a:2$ indicates that the frequency of character 'a' is 2)

$a:22 \quad b:12 \quad c:5 \quad d:10 \quad e:13 \quad f:20 \quad g:18 \quad h:19 \quad i:43$ (10 分)

5. Explain the difference between HTML and XML. Describe at least two applications of XML. (10 分)

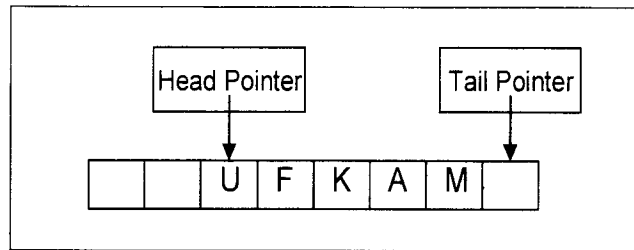
6. In terms of the relations shown below, what is the appearance of the relation RESULT after executing each of these instructions? (12 分)

X relation			Y relation	
U	V	W	R	S
A	Z	5	3	J
B	D	3	4	K
C	Q	5	2	L

- (1) RESULT \leftarrow PROJECT V from X
- (2) RESULT \leftarrow SELECT from X where W=5
- (3) RESULT \leftarrow PROJECT S from Y
- (4) RESULT \leftarrow JOIN X and Y where X.W \geq Y.R

7. Suppose a queue implemented in a circular fashion is in the state shown in the diagram below. Draw a diagram showing the structure after the letters G, R, and Z are inserted, three letters are removed, and the letters D and P are inserted. (8 分)

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8. The following is a procedure for printing the data in a binary tree.

```

procedure PrintTree(Tree)
if (Tree is not empty)
    then (Apply the procedure PrintTree to the tree that
           appears as the left branch in Tree;
           Print the root node of Tree;
           Apply the procedure PrintTree to the tree that
           appears as the right branch in Tree)
    
```

According to the *PrintTree* algorithm, print the data in the three trees shown below. Which tree would be printed in alphabetical order? (8分)

