1. (a) (5%) Find a minimal Boolean expression for the following Karnaugh map.

| WX \ YZ | 00 | 01 | 11 | 10 |
|---------|----|----|----|----|
| 00 | 0 | 1 | – | – |
| 01 | 1 | 1 | – | 0 |
| 11 | 1 | 0 | 1 | 1 |
| 10 | 0 | – | 1 | 0 |

(b) (5%) Use as less NOR gates as possible to implement a logic circuit for the above Boolean function.

2. (6%) Use unsigned binary number representation and 2's complement number representation to calculate 6+5. Assume that each number is represented by a 4-bit word. Does an overflow occur in either case?

3. (5%) Write down the outputs of the following C++ program.

```
int a=2;
void f(int b)
{    double a=3;
        cout<<a+b<<endl;
}
void main()
{
    cout<<a<<endl;
    for(int a=1;a<3;a++)
    {
```

4. (6%) It is known that Hamiltonian cycle problem (HC) is a NP-complete problem (NPC). Show that P=NP if and only if HC is a P problem.

5. (6%) Assume that there are three periodic events in a real-time system. These three events occur with period 100, 200, 300 milliseconds, respectively. These three events require 50, 50, 100 milliseconds of CPU time, respectively. Show that this real-time system is not schedulable.

6. (4%) Explain the following technologies and illustrate their commercial applications respectively: (a) Utility computing (b) Pervasive computing.

7. (a) (3%) Describe the main procedures of the Genetic algorithm and explain the purposes of each procedure.

(b) (2%) Consider a Web service provider facing a demand function $Q=63-P$, where $Q$ is the number of subscription and $P$ is the subscription fee. Explain how to apply the generic algorithm to find the subscription fee $P$ such that the Web service provider's profit is maximized.

8. (a) (4%) Describe the respective role of the digital signature technology and reputation mechanism in the security enforcement of electronic commerce.

(b) (8%) Consider a reputation system described by a quadruple $(G, W, A, T)$, where trust network $G$ is a weighted multigraph $(V, E)$, with $V$ being the set of nodes in the network and $E$ the set of edges which are assigned weights $w_{ij}$ drawn from the feedback data set $W$. Trust inference engine $A$ is an algorithm that operates on the graph and outputs a specific trust value $t_{ij} \in T$ for any request node $i$ and target node $j$ in the network as its input. Write a recursive BFS algorithm $A$ and apply it to infer trust values $t_{1A}$ and $t_{2A}$ in the following trust network, where $W=\{0,1\}$ and $T=[0,1]$. The weight is 1 in all solid edges (high trustworthiness) and 0 in all dashed edges (low trustworthiness).Write down your assumption if any.
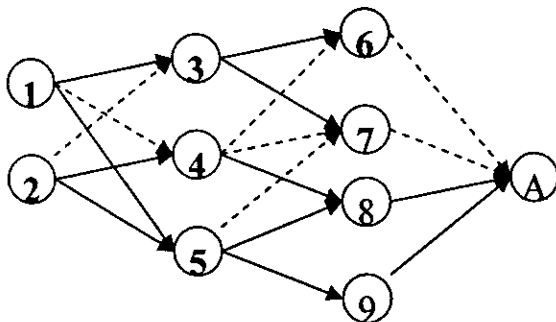


9. (a) (4%) What are the purposes of normalization in database design? Explain the objectives of the first, second, and third normalization respectively.

(b) (4%) Determine the functional dependencies that exist in the following table. After determining the functional dependencies, convert this table to an equivalent collection of tables that are in the third normal form

PART (PartNum, Description, OnHand, Class, Warehouse, Price,

(OrderNum, OrderDate, CustomerNum, CustomerName, RepNum, LastName, FirstName, NumOrdered, QuotedPrice))

(c) (4%) ACID is the acronym that specifies the four required elements of a safe transaction in database systems. Explain these four elements.

10. (4%) To determine whether a specific element is included in a list of $n$ elements, we can apply linear search in $O(n)$ time. Binary search instead takes only $O(\log n)$ time, but at least $O(n \log n)$ time is needed to sort the elements in a specific order; the total time is thus $O(\log n) + O(n \log n) = O(n \log n)$. Give the situation(s) in which we adopt binary search.

國立交通大學 95 學年度碩士班入學考試試題

科目名稱：計算機概論（5091）　考試日期：95 年 3 月 12 日　第 2 節
系所班別：資訊管理研究所　　組別：甲組　　　第 3 頁,共 3 頁
＊作答前,請先核對試題、答案卷（試卷）與准考證上之所組別與考試科目是否相符!!

11. (4%) Describe the major features of Java language which are not present in C language.

12. (4%) What information is stored in i-nodes in Unix-like systems?

13. (12%) In a poker game on the internet, player A and player B each will draw 5 cards from a deck of 52 cards. To secure the fairness of the dealing processing, we want to design a private-key/public-key method. Let functions $F_A$ and $F_A^{-1}$ (respectively, functions $F_B$ and $F_B^{-1}$) denote the private key and the public key of player A (respectively, of player B). The method consists of three steps. Step 1 is given. Complete the remaining two steps.

Step 1: Player A applies function $F_A^{-1}$ to 52 cards and sends the encrypted cards to player B.

Step 2: ???

Step 3: ???

14. (7%+3%) [Huffman's Code] The frequencies of 9 letters are given in the following table. Construct the Huffman's coding tree. Give the code of "smile".

| Letter | a | e | i | o | u | b | l | m | s |
|---|---|---|---|---|---|---|---|---|---|
| Frequency | 45 | 52 | 59 | 38 | 30 | 17 | 41 | 16 | 32 |