

# 淡江大學八十七學年度日間部轉學生入學考試試題

系別：資訊工程學系三年級

科目：資訊概論

本試題共 1 頁

計算題要詳列過程，否則不予計分。

1. Briefly describe the purpose of each of the following network components: (20%)
  - (a) router (or gateway)
  - (b) domain name server
  - (c) (sub)network mask
  - (d) uniform resource locator (URL)
  
2. Suppose we want to transmit the message "ABACDABBCAA". If Huffman code is used to encode the message, how many bits are required? Draw a Huffman tree and write its code for the message. (20%)
  
3. Most personal computers adopt IEEE Standard 754 to implement floating point arithmetic. The standard defines a *single-precision floating point format* consisting of 32 bits, divided into a sign of mantissa (bit 0), 8 bits of exponent (bits 1~8), and 23 bits of mantissa (bits 9~31). Numbers are normalized to the form  $(-1)^S \times 1.MMMMM... \times 2^{EEE...}$ , in which S is the sign bit, the leading bit 1 is not stored, and MMMMM... is stored in the mantissa part. The exponent is formatted using excess-127 notation, with an implied base of 2. (An  $m$ -bit of base 2 number using excess- $n$  notation represents a decimal number ranging from  $(2^m - 1 - n)$  to  $(-n)$ .) What is the 32-bit pattern for the decimal number 13.125 using this standard? (20%)
  
4. A majority function is generated in a combinational circuit when the output is equal to 1 if the input variables have more 1's than 0's. The output is 0 otherwise.
  - (a) Derive the truth table for a 3-input (called A, B, and C) majority function M. (10%)
  - (b) Simplify the above majority (Boolean) function M. (5%)
  - (c) Implement the above function M with a multiplexer. (5%)
  
5. (*The Towers of Hanoi Problem*) There are three pegs (named A, B, and C), and there are  $n$  disks arranged (and numbered from 1 to  $n$ ) from top to bottom by increasing size on peg A, initially. Suppose that we want to move these disks from peg A to peg C under the constraints that exactly one disk is moved at a time, and at no time may a larger disk be placed above a smaller disk. A third peg is available for temporarily holding the disks.
  - (a) Use the C language to write a recursive function called Hanoi, whose function prototype is as follows: (10%)
 

```
void Hanoi(int n, char fromPeg, char toPeg, char auxPeg);
```

 where the argument  $n$  is the number of disks. The function will print all the moves required to achieved the above purpose as follows:
 

```
Move disk 1 from peg A to peg C
Move disk 2 from peg A to peg B
      
```
  - (b) Derive the number of disk moves required for  $n$  disks of the Hanoi problem. (10%)