

國立台灣科技大學九十六學年度碩博士在職專班招生試題

系所組別：電機工程系碩士在職專班丙組

科目：計算機概論

1. Transfer elements from stack S1 to stack S2 so that the elements from S2 will be in the same order as on S1 (12%)
 - (a) Using one another stack
 - (b) Using no additional stack but only some additional variables
2. (a) Draw a block diagram of a typical computer. (b) Explain the function of each block. (12%)
3. Design (a) a full adder by logic gates (b) a 4-bit binary parallel adder. (14%)
4. Simplify the following Boolean function in (a) product of sums form (b) sum of products form. (12%)

$$F(A,B,C,D) = \Sigma m(0,1,2,5,8,9,10)$$
5. Short Answers: (15%)
 - (a) XML (Extensible Markup Language)
 - (b) Top-down vs. bottom-up design
 - (c) Von Neumann Machine
6. Data representation (10%)
 - (a) Please present $(10110.100011)_2$ with the IEEE 754 standard format.
 - (b) What is the decimal number presented by the following IEEE 754 format?
0 10000011 110000000000000000000000
7. Please illustrate the interrupt handling procedure for generic handlers (i.e., the procedure since an interrupt occurs.). What problem DMA solves for high-speed I/O devices? Is it ok to use programmed I/O for DMA devices? You must provide explanation. (10%)
8. Algorithms & Time Complexity: (15%)
 - (a) What's the time complexity, in big-O notation $O(\cdot)$, of the algorithm below?

```

for(i=0;i<n;i++)
  for(j=1;j<i;j++)
    x=x+1;

```

- (b) What's the time complexity of the following recurrence relation?

$$T(n) = 4 \cdot T(n/4) + n$$

- (c) Show the output generated by a call to G(5);

```

void G(int N){
  if(N > 0){
    cout << "starting G " << N << endl;
    G(N-1);
    cout << "ending G " << N << endl;
  }
}

```

國立台灣科技大學九十六學年度碩博士在職專班招生試題

系所組別：資訊工程系碩士在職專班、高職教師組

科 目：資訊工程概論

總分 100 分

1. (10%) Is the logical expression $(p \wedge \neg q) \vee (\neg p \vee q)$ a tautology or not? Prove your answer.

2. (10%) Given three sets A_1 , A_2 and A_3 , show that $|A_1 \cup A_2 \cup A_3| = |A_1| + |A_2| + |A_3| - |A_1 \cap A_2| - |A_1 \cap A_3| - |A_2 \cap A_3| + |A_1 \cap A_2 \cap A_3|$ where $|S|$ denotes the number of elements of set S .

3. (15%) Please solve the recurrence

$$T_n = 6T_{n-1} - 8T_{n-2}, \quad 2 \leq n \leq \infty$$

with $T_0 = 3$ 和 $T_1 = 4$.

4. (15%) Show that the number of faces (or regions) in the simple planar graph is at most $2|V| - 4$ where V denotes the set of vertices in the graph. (Hint: Using Euler Formula and deriving inequalities)