

國立臺灣科技大學  
九十三學年度碩士在職專班招生考試試題

系所組別：電機工程系  
科 目：計算機概論

總分 100 分

1. Write down the full name of the following acronyms (10%)

- (a) ALU                      (b) DMA                      (c) LCD  
(d) MIPS                      (e) ISDN

2. Explain the following terms (16%)

- (a) ATM                      (b) CISC  
(c) RAM vs. ROM              (d) Modem

3. Given a 8-bit binary data 10111011. (12%)

- (a) If the data is an unsigned integer, what is its value in decimal?  
(b) If the data is of 2's complement, what is its value in decimal?  
(c) If the data is of signed-magnitude representation, what is its value in decimal?

4. Answer the following questions about time complexity

- (a) What's the time complexity (in big-O notation) of the algorithm with the recurrence relation

$$T(n) = 2 \cdot T(n-1) + n \quad (5\%)$$

- (b) What are the time complexities of the two algorithms shown in Fig.P4.1 and Fig.P4.2? (12%)

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

Fig.P4.1

```
for (i = 0; i < n; i++)
  for (j = 0; j < n; j++) {
    sum = 0;
    for (k = 0; k < n; k++)
      sum += a[i][k] * b[k][j];
    c[i][j] = sum;
  }
```

Fig.P4.1

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5. There is a 4-segment floating-point add/subtract pipeline. Assume that the time delays of the four segments are  $t_1=7ns$ ,  $t_2=9ns$ ,  $t_3=8ns$ ,  $t_4=9ns$ , and the interface registers have a delay of  $t_0=1ns$ . (15%)
- (a) Determine the pipeline clock rate, and find the time taken to add 1000 pairs of floating-point numbers using this pipeline.
- (b) What is the speedup of the pipeline when 1000 pairs of the floating point numbers are added.
6. Construct the function  $f(a,b,c,d)=\sum m(1,3,4,9,14,15) + d(5,7)$  using:
- (a) An 8-input multiplexer; (7%)
- (b) A minimal number of 4-input multiplexers. (8%)

Draw the schematic diagram to illustrate the implementation

7. What is the minimum cost spanning tree of the undirected graph shown in Fig.P7? (7%)

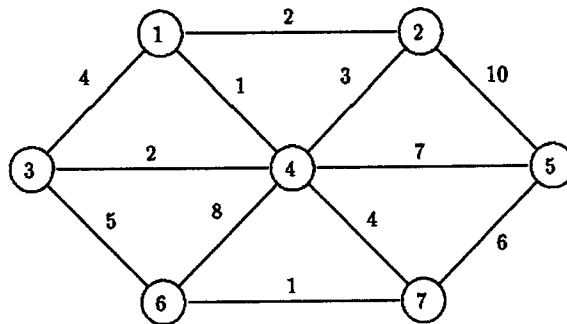


Fig. P7. The undirected graph

8. If the pre-order traversal of a binary tree is ABCDEFGHI and the in-order traversal is CDBAFGEIHJ, what is the original binary tree? (8%)